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THE MULTIPLICITY OF ORIGIN OF MALIGNANT TUMORS

Collective Review

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THE traditional concept of cancer as an isolated biological accident is no longer tenable. From recent advances in our knowledge of the pathological and pathophysiological background of the neoplastic diseases, it is becoming increasingly apparent that malignant tumors have a number of etiological relationships. A study of the occurrence of multiple malignant tumors affecting one individual may be of interest as one phase of the problem. The presence of multiple cancers in one patient has excited the interest of many investigators, and a considerable literature has accumulated on this subject. Double and even triple primaries in one person are by no means rarities and a great many such cases have been reported. It has seemed to be of some value to review the problem of the multicentric origin of cancer. In this communication the problem will be discussed from three standpoints: the microscopic origin of single tumors; the benign and malignant tumors known or generally considered to be of multiple origin; and lastly, an analysis of tabulated cases of double primary carcinomas, to determine what, if any, are their patterns of localization.

MICROSCOPIC EVIDENCE OF MULTIPLE ORIGIN

The older concept of a malignant tumor arising from one cell, which divides and increases by geometrical progression, should be discarded. It now seems probable that many tumors arise from multiple foci of neoplastic change, in immediate adjacency to each other. These foci coalesce as growth occurs, and produce the lesion which clinically is seen as a single tumor. This latter concept is well demonstrated by the microscopic appearance of sections of so-called "carcinoma *in situ*." Broders (3) in 1932 used this term for those lesions in which the cells are histologically malignant but have not yet invaded the basement membrane of the epithelial layer. He showed sections of such lesions from the skin, cervix, larynx, and other areas. Other authors have demonstrated "carcinoma *in situ*" in other organs and locations, most recently Foote and Stewart (11) in the female breast, and Mallory (23) in the gastric mucosa. Such lesions are not uncommon in the rectum and colon, particularly in association with polyposis. Paget's disease of the nipple has been considered an example of such a lesion. Brill-Symmer's disease, or giant follicular lymphadenoma, has also been considered an analogue of these epithelial lesions, as a precursor of invasive lymphosarcoma. "Intraepithelial epidermoid carcinoma *in situ*" of the skin is the most common lesion of this type and has been known for many years as Bowen's disease. These lesions are true cancer, and will eventually invade and kill their host. Their importance lies in the fact that sections of these lesions show the anaplastic change to be taking place simultaneously in many areas of the involved epithelium, these areas not being connected by any vascular channels which could transport cells from one location to the other. Ewing (10) has recognized and accepted these lesions as being examples of the multicentric origin of cancer.

BENIGN AND MALIGNANT TUMORS COMMONLY CONSIDERED TO BE OF MULTICENTRIC ORIGIN

From the macroscopic standpoint, there are many tumors which characteristically develop from multiple foci of origin. There are a number

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of benign neoplasms which everyone accepts as arising in multiple areas. Some of these lesions are considered totally benign, others as tumors which occasionally undergo malignant transformation, and some are considered as "precancerous" lesions. Such definitions are based on percentage considerations, as there is no known benign neoplasm which does not have its malignant expression, rare as it may be.

Probably the most frequent benign tumors are the common moles or neuronevi. It is thought that almost no human being is free from them. Fortunately, the malignant melanoma that may arise from these lesions is very infrequent, and multiple melanomas are even more rare, although they do occur. Lipomas are another type of common benign tumor which is frequently multiple. Stout (37) recently has made several case reports of multiple liposarcomas in which he relates their genesis to multiple lipomas in the individuals described. The various keratoses of the skin are another example of multiple benign tumors, some of which are considered "precancerous." These lesions are common accompaniments or precursors of skin cancer. Von Recklinghausen's disease is an example of a neoplastic entity in which multiple benign neurofibromas may de-differentiate into neurogenic sarcoma. Certain tissues of entodermal or mesodermal derivation have characteristic multiple benign lesions which are more or less frequently associated with malignant transformation. The most common of these are polyps of the stomach and colon, papillomas of the urinary bladder, and fibromyomas of the uterus. All of these benign lesions, which occur as multiple independent neoplasms, are a potential source of multiple malignant tumors.

There is a large group of malignant neoplasms which characteristically arise as multiple tumors. Opinion is divided as to whether they actually arise in separate and independent sites as part of a general or systemic disease process, or whether their many foci represent metastases. The consensus is that they represent true malignant tumors of multiple, independent, and synchronous, or metachronous, foci of origin.

The most obvious of such lesions are the lymphoma group of neoplastic disease. The usual occurrence of lymphosarcoma certainly suggests simultaneous origin in different areas of lymphoid tissue in many cases. The Brill-Symmer's type of giant follicular lymphadenoma is even more probably a systemic disease of the lymphoid apparatus. The leucemias are almost certainly a diffuse disease of the lymphoid, reticuloendothelial, and hemopoietic tissues, both in their lymphatic and myelogenous phases. Chloromas also appear to be tumors of multiple or diffuse origin. Hodgkin's disease, if one accepts it as a neoplastic lesion, would seem in many instances, although not in all, to be a disease of multiple origin, or at least of systemic stimulation. Multiple myeloma is another disease, histogenetically related to the lymphomas, that characteristically presents itself at many skeletal points simultaneously. The descriptive term given to this tumor implies its multiplicity of origin, and it has been generally, although not completely, accepted as such a disease.

One type of carcinoma of the liver occurs as a diffuse neoplastic involvement of this organ, usually in association with some degree of cirrhosis. It is generally considered that this type of lesion is a tumor of multiple foci of origin throughout the liver. Such lesions may be diffuse parenchymal hepatomas or they may be bile-duct carcinomas arising simultaneously in scattered areas in the liver.

Low-grade papillary carcinomas of the urinary bladder constitute another example of the more common epithelial tumors which tend to occur as a multiple disease in one organ. If one accepts the Bladder Registry classification of most bladder papillomas as grade I papillary carcinoma, then this type of lesion is of even more common occurrence as a multiple tumor. In this consideration it should be stated that many pathologists do not agree with this classification. The invasive squamous carcinomas of the bladder, which everyone recognizes as such, do not tend to be multiple in the clinical sense although they may form by coalescence of microscopically related anaplastic cell groups.

Neurogenic sarcomas form a group of neoplastic entities which tend to occur in different nerve trunks, or in different areas of one nerve trunk, simultaneously. Some of these lesions arise on a background of von Recklinghausen's disease, which is a diffuse disease of the peripheral nervous system. Others arise without recognizable pathological precedent, but they all tend to be multiple, and the characteristic clinical story of such a case is repeated recurrence of the lesion higher and higher in the involved nerve trunk, after repeated excisions or amputations, until the patient succumbs to pulmonary metastases. These recurrences of the tumor are considered to be new foci of origin, and not metastases. It is thought that the nerve trunks have been so conditioned that many cell groups progressively break down into neoplastic change under the influence of an as yet unknown carcinogenic stimulus or release.

Kaposi's disease, or idiopathic multiple hemorrhagic sarcoma, is a neoplastic disease characterized by multiple foci of origin. The lesions of this tumor may occur simultaneously in scattered areas about the extremities, involving both feet, or hands and feet, in a manner that practically precludes metastatic origin. The slow progression of the disease also suggests progressive breakdown of conditioned cell groups, rather than embolic implantation.

MULTIPLICITY OF MALIGNANT TUMORS WHICH ORDINARILY OCCUR SINGLY

The occurrence of two separate and distinct malignant tumors in the same individual, either in the same organ or in different tissues, has excited the interest of a great many observers, and many facets of the problem have been subjected to statistical analysis. Billroth is credited with reporting the first cases of multiple primary carcinoma in 1879. He also established criteria for the diagnosis of multiple primary tumors. His rules were so rigid that they finally were abandoned when it was realized that, if strictly applied, they would rule out even a single primary tumor. He insisted that the tumors must be in different organs and of different cell types, and must produce their own metastases.

In recent years the acceptance of cases as true instances of multiple primary malignant tumors has been much more liberal and realistic, and the incidence of such cases is recognized as much greater than was formerly thought. There are many reports in the literature of instances of multiple cancers, varying from one case to several hundred. The most significant of these are by Warren and Gates (39), Hurt and Broders (15), Hanlon (14), Stalker, Phillips, and Pemberton (36), Schreiner and Wehr (33), Burke (5), and Bugher (4). In these studies the incidence of multiple primary tumors has been calculated largely from autopsy statistics plus what controlled clinical material was available. On the basis of these reviews the average incidence in America of multiple primary malignant tumors is approximately 3.9 per cent of all cancer cases. This figure is probably a conservative estimate, subject to the well known errors in autopsy material. It is higher than reports from European sources. The majority of American authors agree that the actual incidence is significantly higher than could be expected on the basis of chance alone. If this assumption is valid, and it seems to be, it is an important observation. Bugher (4), in a thorough mathematical study of the problem, has proved that the reported incidence exceeds the expected rate of occurrence based on chance, and further states that if one considers that a certain unknown portion of the population is not subjected to the cancer risk, because of lack of inherent susceptibility, the difference between the actual and the expected rate would be even more striking. This last premise, although at present not amenable to proof, seems a reasonable one. Lombard and Warren (21) published, in 1943, a significant study of the incidence of multiple tumors in a controlled group of patients. Of 1,990 patients observed in the Massachusetts Cancer Program, 117 patients subsequently developed a second primary carcinoma. The calculated expected number would be from 80 to 85, and thus there is a significant difference from the actual rate. It was concluded that the presence of one cancer does not confer immunity, but, on the contrary, that patients with one cancer are more susceptible to the disease than are individuals who have never had one.

Kilgore (18) in 1921 reported a follow-up study on a series of 659 women with breast cancer. Thirty-seven of these patients subsequently developed primary cancer in the opposite breast. From a statistical comparison he concluded that a woman who has had one breast cancer is from three to four times as likely to develop one in the other breast as is a normal woman to have one breast carcinoma. If it is true, as most students of the subject have concluded, that the patient with one cancer is more likely to have another than a normal person is likely to have cancer, there is one very good reason why the incidence of multiple tumors is no higher than it is. The total cure rate of all cancer cases in this country is probably not more than 15 per cent, and possibly less. Therefore, very few patients with one cancer survive long enough to develop another. Estabrook (9) reported in 1932 a study of the end-results of 1,802 cancer cases treated in Philadelphia hospitals. His follow-up was 93 per cent, and of this group only 10.6 per cent were alive six years.

Another reason, less important numerically, for the low incidence of multiple primary tumors, is the mental habit of most physicians to ascribe the occurrence of a new tumor, in a known cancer case, to a recurrence of the original lesion. There is enough mysticism in the attitude of the average physician toward cancer that practically any possibility is attributed to any given tumor, without realization that the usual malignant tumor grows, spreads, and kills along fairly definite patterns of anatomic involvement and physiological interference.

TABLE I.—THE DISTRIBUTION OF MULTIPLE TUMORS—MAJOR GROUPS

	No. of cases	Percentage
Multiple carcinomas of the same organ	749	40.0
Multiple carcinomas of paired organs	269	14.4
	1,018	54.4
G. I. tract, multiple carcinomas, from mouth to anus	145	7.7
G. U. tract, multiple carcinomas	18	.9
Female genitalia, multiple carcinomas	32	1.7
Carcinomas of skin associated with G.I. tract	51	2.7
Carcinomas of skin associated with G.U. tract	55	2.9
Carcinomas of skin associated with breast	39	2.1
Carcinomas of breast and G.U. tract	65	3.4
Carcinomas of breast and G.I. tract	35	1.9
Carcinomas of G.U. and G.I. tracts	120	6.4
Miscellaneous multiple carcinomas	104	5.6
Carcinoma of lung with other cancers	34	1.8
Sarcomas, multiple in same organ	7	.3
Sarcomas, multiple in paired organs	16	.6
Sarcomas, multiple in different systems	3	.2
Sarcomas associated with carcinoma in same organ	35	1.8
Sarcomas associated with carcinoma in symmetrical organs	5	.4
Sarcomas associated with carcinoma in same system	4	.3
Sarcomas miscellaneous	82	4.3
	1,868	

Our increasing knowledge of the behavior of malignant tumors has steadily cut down the taboos on recognition of second primaries. Multiple skin cancers are accepted by everyone as being independent tumors and not metastases from a single focus. Other combinations of cancers may be equally clear. For instance, a patient with squamous carcinoma of the upper esophagus and colloid carcinoma of the rectum is obviously a victim of two cancers and not a subject of transcendental metaplasia. In contrast to the many clear-cut instances of multiple primaries, however, there is a large number of situations in which decision may be very difficult. Patients with carcinoma of the stomach and ovary present the problem of differentiation between independent tumors and gastric carcinoma with Krukenberg tumors. In such a case common sense must be utilized. If the ovarian tumor is a dysgerminoma and the gastric lesion a low-grade adenocarcinoma without demonstrable metastases, it may be permissible to consider them separate primaries. Again, if the ovarian lesion occurred ten years before the gastric lesion became apparent, the two tumors are probably independent. Bilateral breast cancer is another situation that may be very confusing. Since cutaneous metastases to the opposite breast, particularly in the form of carcinoma "encuirasse," are so well known, parenchymal metastases are considered to be equally possible. Whether or not this is questionable, those patients who are first seen with simultaneous bilateral breast lesions, each resembling primary tumors, and without intervening cutaneous metastases, may be reasonably considered to present multiple primary tumors. Likewise, when a patient develops a lesion in the remaining breast from one to fifteen years after removal of the other gland because of cancer, with no evidence of recurrence of the previous lesion, and if the second appears in all respects as a typical primary breast cancer, this second tumor should be considered a new focus of neoplastic disease, and not a cellular descendant of the first lesion. This is not to say that such tumors are unrelated, because they probably are, from the standpoint of etiology. There are many other instances in the consideration of multiple tumors in which the independency may be either obvious or obscure. Such problems should be judged conservatively on the basis of common sense in pathology and oncology.

The occurrence of more than one primary malignant tumor in one individual has so many potential combinations that it would seem to be of interest to tabulate a number of such cases and analyze them from the standpoint of patterns of localization. Since no one clinic has recorded enough of such cases to present a statistically valid report, a compilation from the literature is the only recourse. Accordingly, a review of reported cases has been made and 1,828 instances of multiple malignant tumors have been tabulated. Forty cases from the records of the tumor clinics of the Research and Educational, and the Presbyterian hospitals, have been added to this list, which makes a total of 1,868 cases available for analysis. This is by no means all of the reported cases, but it would seem to be enough to indicate the trend of multiple-tumor occurrence. As much critical judgment as possible has been used in selecting these cases, both from the literature and from our own series. From the reported cases we have not listed those in which one tumor was benign, or instances reported in animals, and we have declined to accept lesions reported as carcinosarcoma. Such a diagnosis we believe is too uncertain to permit classification as a double tumor. We consider that the cases we have listed were reported by their authors in good faith as representing true instances of multiple malignant tumors occurring independently in one patient. A small percentage of these cases in the literature have three or more separate tumors. These have been included in our tables as double primaries for the sake of condensation. The majority of

these involve the skin and therefore do not affect the percentage results at all. Of the 1,868 cases listed, 788 have been taken from the excellent review by Warren and Gates published in 1932 (39). These authors reported 1,269 cases, including 40 of their own. Of this group they reported 794 in some detail, plus their own 40, and we have utilized 788 of these.

In the further compilation of the series which is reported here, we have made every effort to avoid reduplication of the cases reported in different series by more than one author. For a more complete bibliography on the subject than is listed in this communication, the study of Warren and Gates should be consulted.

Table I is a listing of all the cases collected, arranged in a condensed classification. The most striking fact shown in this table is the tendency of multiple tumors to occur in the same type of tissue, either the same organ or in paired organs. Fifty-four and three-tenths per cent of the individual instances of multiple cancer occurred in a single organ or in each of paired organs. This percentage is of even greater significance when compared with the almost infinite number of possible combinations of tissues affected by malignant tumors.

Table II lists a more detailed outline of the multiple tumors occurring in single or in paired organs. Carcinoma of the skin is the lesion comprising slightly more than half of these tumors. This is to be expected, as carcinoma of the skin is probably the most frequent malignant tumor affecting the human body. Furthermore, the skin is also the largest organ of the body. This latter consideration is important from two standpoints. In the first place, there is more tissue to be exposed to carcinogenic stimuli; secondly, the extent of surface area allows two tumors to be spaced far enough apart so that they do not coalesce early and consequently appear as one. This last point is in contrast to areas such as the cervix, in which separate cell groups undergoing simultaneous carcinomatous change would necessarily merge as one tumor early in their growth.

The fact that skin carcinomas are so frequently multiple is well recognized by everyone familiar with these lesions. Although by no means complete, our knowledge of the etiology of skin cancer is greater than that of any other malignant tumor affecting human beings. The mode of action of, or the exposure to, the different factors recognized today as effective in producing skin cancers furnishes a good explanation of the multiplicity of these lesions. The "actinic cancers," due to exposure to the ultraviolet spectrum, occur charac-

TABLE II.—DETAILED OUTLINE OF MULTIPLE TUMORS

	No. of cases
Multiple carcinomas of one organ	
Squamous and basal-cell carcinomas of skin	511
Carcinoma of skin and lip	22
Squamous carcinoma of skin and melanoma of skin	4
Multiple melanoma of skin	3
Colon	116
Stomach	33
Uterus	19
Tongue	12
Esophagus	8
Lip	11
Ileum	3
Bladder	4
Cervix	1
Duodenum	1
Brain	1
Total	749
Multiple carcinomas of paired organs	
Breasts	155
Ovaries	23
Testicles	49
Salpinges	11
Kidneys	17
Adrenals	5
Lungs	3
Thyroids	3
Seminal vesicles	1
Eye (glioma)	1
Parotids	1
Total	269
Carcinoma of G. I. tract—mouth to anus	
Of stomach and of colon	38
Of stomach and of esophagus	26
Of colon and of esophagus	11
Of lip and of buccal mucosa	9
Of stomach and of tongue	6
Of stomach and of pharynx	5
Of stomach and of small bowel	5
Of stomach and of lip	5
Of esophagus and of pharynx	4
Of buccal mucosa and of tongue	4
Of colon and of small bowel	4
Of rectum and of lip	4
Of pharynx and of tongue	3
Of gingiva and of buccal mucosa	3
Of esophagus and of small bowel	2
Of esophagus and of tongue	2
Of colon and of buccal mucosa	2
Of stomach and of buccal mucosa	2
Of jejunum and of tongue	2
Of tonsil and of anterior floor of mouth	2
Of appendix and of ileum	1
Of appendix and of stomach	1
Of colon and of tongue	1
Of duodenum and of tongue	1
Of gingiva and of ileum	1
Of lip and of tonsil	1
Total	145

TABLE II.—DETAILED OUTLINE OF MULTIPLE TUMORS—Continued

	No. of cases
Carcinoma of G. U. tract	
Of bladder and of prostate	3
Of prostate and of kidney	3
Of kidney and of uterus	3
Of bladder and of seminal vesicle	2
Of kidney and of prostate	2
Of testicle and of prostate	2
Of uterus and of urethra	1
Of urethra and of prostate	1
Of cervix and of bladder	1
Total	18
Carcinoma of female genitalia	
Of uterus and of ovary	21
Of cervix and of ovary	4
Of uterus and of vulva	2
Of uterus and of salpinx	2
Of cervix and of fundus	2
Double primaries of uterine fundus	1
Total	32
Carcinoma of skin and G. I. tracts	
Of skin and of colon	15
Of skin and of stomach	13
Of skin and of buccal mucosa	14
Of skin and of tongue	2
Of skin and of esophagus	3
Of lip and of stomach	2
Of lip and of colon	2
Total	51
Carcinoma of skin and G. U. tracts	
Of skin and of penis	7
Of lip and of penis	3
Of skin and of testicle	2
Of skin and of cervix	13
Of skin and of bladder	4
Of skin and of uterus	3
Of skin and of prostate	12
Of skin and of kidney	5
Of skin and of adrenal	1
Of skin and of ovary	1
Of skin and vagina	2
Of skin and of prostate	2
Total	55
Skin and breast	
Carcinoma of skin and of breast	33
Carcinoma of lip and of breast	4
Melanoma of skin and carcinoma of breast	2
Total	39
Carcinoma of breast and G. U. tract	
Of breast and uterus	29
Of breast and of ovaries	14
Of breast and of cervix	10
Of breast and of bladder	4
Of breast and of kidney	2
Of breast and of vulva	4
Of breast and of vagina	2
Total	65

TABLE II.—DETAILED OUTLINE OF MULTIPLE TUMORS—Continued

	No. of cases
Carcinoma of breast and G. I. tracts	
Of breast and of stomach	18
Of breast and of colon	15
Of breast and of esophagus	1
Of breast and of anus	1
Total	35
Carcinoma of G. U. and of G. I. tracts	
Of uterus and of stomach	15
Of colon and of kidney	14
Of colon and of ovary	9
Of stomach and of kidney	9
Of colon and of uterus	8
Of stomach and of prostate	8
Of stomach and of cervix	7
Of colon and of prostate	7
Of colon and of cervix	5
Of stomach and of bladder	4
Of esophagus and of kidney	4
Of stomach and of ovary	4
Of tongue and of prostate	4
Of colon and of penis	3
Of pharynx and of kidney	2
Of colon and of salpinx	1
Of anus and of cervix	1
Of esophagus and of cervix	1
Of stomach and of penis	1
Of esophagus and of uterus	1
Of pharynx and of prostate	1
Of tongue and of bladder	1
Of tonsil and of cervix	1
Of rectum and of urethra	1
Of colon and of bladder	1
Of colon and of vulva	1
Of anus and of bladder	1
Melanoma of rectum and carcinoma of uterus	1
Carcinoma of duodenum and of bladder	1
Carcinoma of stomach and of testicle	1
Carcinoma of gingiva and of penis	1
Carcinoma of esophagus and of prostate	1
Total	120
Carcinoma miscellaneous	
Of lung and of stomach	7
Of lung and of prostate	6
Of lung and of kidney	4
Of lung and of skin	2
Of lung and of bladder	1
Of lung and of colon	3
Of lung and of gall-bladder	2
Of lung and of tongue	1
Of lung and of esophagus	2
Of lung and of liver	1
Of lung and of ileum	1
Of lung and of breast	2
Of lung and of uterus	2
Of liver and of mouth	1
Of liver and of stomach	1
Of liver and of tongue	1
Of liver and of breast	1
Of liver and of esophagus	1
Of bile ducts and of esophagus	2
Of liver and of colon	2
Of liver and of kidney	1

TABLE II.—DETAILED OUTLINE OF MULTIPLE TUMORS—Continued

	No. of cases
Carcinoma miscellaneous—Continued	
Of liver and of prostate	2
Of stomach and of larynx	2
Of stomach and of parathyroid	1
Of stomach and of hepatic duct	1
Of stomach and of pancreas	3
Of stomach and of brain	1
Of stomach and of common duct	1
Of stomach and of gall-bladder	1
Of bile ducts and of prostate	1
Of pancreas and of cervix	3
Of pancreas and of colon	4
Of pancreas and of gall bladder	3
Of pancreas and of esophagus	2
Of pancreas and of tongue	1
Of pancreas and of prostate	3
Of pancreas and of bladder	1
Of thyroid and of gall bladder	1
Of thyroid and of larynx	1
Of thyroid and of stomach	1
Of thyroid and of breast	3
Of thyroid and of uterus	3
Of thyroid and of ovary	2
Of thyroid and of kidney	1
Of thyroid and of colon	1
Of larynx and of esophagus	2
Of larynx and of ileum	1
Of larynx and of lip	1
Of larynx and of bladder	1
Of larynx and of pharynx	1
Of larynx and of skin	4
Of larynx and of trachea	1
Of larynx and of prostate	1
Of gall bladder with carcinoma of ovary	3
Of gall bladder with carcinoma of bladder (see pancreas)	2
Of kidney and branchiogenic carcinoma	1
Of kidney and of eye	1
Of kidney and of pancreas	1
Of colon and of brain	1
Of colon and of common duct	1
Of colon and of hepatic duct	1
Of colon and of gall bladder	4
Of colon and adamantinoma of jaw	1
Of colon and of adrenal	1
Of colon and Kaposi's disease	1
Of salivary gland and of skin	6
Of salivary gland and of tongue	1
Of salivary gland and of buccal mucosa	1
Of skin and of nasopharynx	3
Of skin and of antrum	5
Of skin and of liver	2
Of skin and of pancreas	1
Of skin and adenocarcinoma of neck	1
Of skin and of thyroid	1

teristically on the face, neck, ears, and dorsum of the hands, these areas being most commonly exposed to solar radiation. The same thing is true of the exaggerated response of those unfortunate individuals afflicted with xeroderma pigmentosa. Skin cancer as an industrial problem occurs in those areas of the integument with the greatest exposure to carcinogenic chemicals. The classic "chimney sweep's" cancer is an example which has its modern counterpart in the scrotal cancer due to prolonged exposure to the hydrocarbons of oil-soaked clothing. Mechanics working in oil have similar exposure affecting the hands and forearms only, and individuals developing skin cancer in these areas tend to have multiple tumors. Patients with skin cancer following generalized hyperkeratosis due to the ingestion of arsenic, constitute a group of patients whose disease might be considered as arising from metabolic causes. In such, the carcinogenic agent is distributed through the circulatory system and the effect is generalized and follows no specific pattern. From our imperfect knowledge of the etiology of skin cancer alone, it seems obvious that there are two factors in balance in any given problem of carcinogenesis. One is the carcinogenic agent, chemical or physical, and the other the as yet unknown immunity factor. The last is effective in a greater or lesser degree in any tissue reaction to carcinogenic agents. Whether its effect is systemic or local, and whether it may vary locally in a given tissue are problems still to be ascertained. Local variation of tissue immunity could be a factor in the growth of multiple tumors.

Table II shows that the gastrointestinal tract is most commonly affected by multiple tumors in single organs. In this group of cases the colon is the most frequently involved. Our factual knowledge of the etiology of carcinoma of the large bowel is practically nil. The only relationship known in regard to multiple tumors of the colon is that of polyposis. This disease has long been known to be associated with multiple cancers of the colon, and yet its percentage incidence is too low to be the sole factor in such lesions. A surface, or contact, carcinogen contained in the fecal stream, which would affect the whole mucosal surface would be a more logical explanation, but such a chemical has not been demonstrated so far.

The multiple carcinomas of the stomach listed in Table II were somewhat of a surprise, as we are not accustomed to thinking of gastric cancer as being multiple. Leiomyoma and leiomyosarcoma of the stomach are well known to be multiple, as is also gastric polyposis. The latter, however, is much less frequently seen as a multiple condition than is colonic polyposis, and its relationship to carcinoma has not been so thoroughly emphasized. Here again it seems possible that a surface, or contact, carcinogenic agent would be a logical explanation of the multiplicity of origin of gastric cancer. Such an agent has not as yet been demonstrated.

In the listing of paired organs involved by cancer, it is expected that the breasts should be most frequently involved. This would follow naturally from the incidence of mammary cancer in the population as a whole. As stated before, it is probable that bilateral primary mammary cancer is more frequent than is recorded because of the tendency to regard second breast tumors as metastases from the first. If the present trends of thought as to the etiology of mammary cancer are in the right direction, it would be logical to expect bilateral tumors more frequently than they are recorded. Our present conception of the disease is that of a systemic disease of the mammary apparatus, probably predicated on an endocrine background. If such a theory is subsequently proved to be correct, it will easily explain bilateral occurrence of breast cancer. Wood and Darling (41) have recently published a study of a family in which in four generations 6 females had breast cancer, and in 4 the condition was bilateral. The hereditary factor in multiple tumors seems to be important, and will be discussed later.

Of the other paired organs with bilateral cancer listed in Table II, the same questions arise. Are they bilateral because of a systemic background affecting both organs equally, or is it pure chance? The figures given for bilateral ovarian and testicular tumors are at variance with clinical experience. Bilateral ovarian cancers are much more frequent than bilateral testicular tumors, but clinicans have been reluctant to consider them as independent lesions because the majority of cases are examined so late in their course that the possibility of transperitoneal implantation cannot be ruled out. The author is of the opinion that bilateral primary tumors occur much more frequently than is indicated, just as bilateral ovarian cysts occur. In the latter type of case there is no question of metastatic origin of one of the tumors.

The number of testicular tumors listed in Table II as being bilateral probably gives an artificial picture of their incidence. This number is due to an industrious search of the literature by Pierson (31) who reported 1 case of his own and 46 others previously reported. These cases are all, of course, accepted as valid examples of primary bilateral testicular neoplasms, but such tumors do not occur more frequently than ovarian lesions, as Table II would indicate.

In Table II are included 3 cases of carcinoma of the thyroid gland, in which both lobes were simultaneously involved. The patients were from the Illinois Research Hospital series. Such cases have not been reported previously as examples of the multiple origin of cancer, probably because the thyroid area is so small that involvement of both lobes has been taken for granted because of direct extension or metastasis. A more critical examination of the problem, however, will reveal that bilateral independent tumors are quite possible and even probable. The lymphatic drainage, although intercommunicating, is centrifugal from each thyroid lobe, as is also the venous flow. Fetal adenomas are frequently seen in both lobes and they are a well recognized source of thyroid carcinoma. Surgical exploration of thyroid cancers, even in the advanced and inoperable lesions, usually reveals the disease to be unilateral, and in the author's experience, both at autopsy and in the operating room, the opposite lobe is usually found to be uninvolved. Therefore, these 3 cases are presented as examples of bilateral simultaneous thyroid carcinoma. One patient was operated on four years ago by Warren H. Cole, and at that time both lobes were found to be independently involved by tumor, without coextension. Both lobes were resected *in toto*, and the patient shows no evidence of recurrent disease at present. The second patient presented a similar situation, but died following the operation. At autopsy no residual disease was found. The third patient was a twelve-year-old girl whose first evidence of disease was an enlarged node on the left side of the neck. Section of this revealed papillary carcinoma of thyroid origin, and a bilateral total thyroidectomy was done. Both thyroid lobes were involved by what appeared to be independent small foci of papillary, invasive thyroid carci-

TABLE III. — CASES FROM UNIVERSITY OF ILLINOIS, RESEARCH AND EDUCATIONAL HOSPITALS AND PRESBYTERIAN HOSPITAL TUMOR CLINICS

Multiple stomach	1
Multiple lip	3
Tonsil and anterior floor of mouth	2
Skin and gingiva	1
Spindle cell sarcoma of thigh, multiple carcinomas of colon, and desmoid tumor of abdominal wall in a male	1
Cervix and bladder	1
Colon and Kaposi's	1
Colon and leukemia	1
Bilateral breast	5
Penis and lip	1
Colon and breast	1
Lip and tonsil	1
Pharynx and esophagus	1
Multiple colon	5
Thyroid, bilateral	3
Prostate and testicle	1
Skin, antrum, gingiva	1
Multiple skin	10
Total	40

noma, which had metastasized only from the one side. The author was privileged to examine the surgical specimen of this case through the courtesy of Coye Mason.

The single case of glioma of the eye reported in Table II as a bilateral tumor occurring in a paired organ is worthy of comment. These tumors, although fortunately uncommon, often involve both eyes when they occur. The accepted explanation is that the tumor starts in one retina, or optic nerve, then crosses the optic chiasm and presents in the other eye. This is reasonable enough, and yet it seems just as reasonable to assume that the optic tract becomes involved, not by direct extension of the malignant cells, but by progressive breakdown of the conditioned cell groups into malignant tumor tissue. If this latter premise were correct, glioma of the eye would be one of the tumors which characteristically occurs as a neoplastic disease of multicentric origin. This cannot be proved at the present time, but is presented here only as an alternative theory of the histogenesis of this tumor.

All the remaining combinations of multiple tumors occurring in different organs are listed in Table I. This amounts to 850 cases of multiple-tumor occurrence, which are arranged according to the patterns in which they tend to fall in the largest number. Most of the headings in Table I are selfexplanatory and form obvious groupings. It is expected that the combinations of multiple tumors involving the gastrointestinal tract would make up the largest number, because of the normal incidence of such tumors singly. In this group the combination of carcinomas of the stomach and colon occurred 38 times, of the stomach and esophagus 26 times, and of the colon and esophagus 11 times. All other combinations occurred in smaller numbers (mostly 1 or 2 cases of each).

In the genitourinary tract and the female genitalia, the patterns of double primary lesions follow the normal tumor incidence in these regions.

The rest of the groupings in Table I are worthy of little discussion, and occur about as would be expected on the basis of chance. The combination of cancer of the breast and of the genitourinary tract is greater than has been reported previously. In 59 of the 65 cases reported here the second tumor was in the female genital tract, 39 of the tumors being in the uterus, including the cervix, and 10 in the ovaries. Murray (27) in 1927 stated that this combination was quite infrequent, and the point has been discussed pro and con in the literature since then.

The double primaries involving sarcomas offer little for discussion. The 16 reported cases of sarcoma occurring in each of paired organs comprise 11 instances of bilateral Wilm's tumors. Otherwise these cases constitute curiosities and are of little scientific interest. The association of sarcomas with other sarcomas, or with carcinomas, seems to occur at random and forms no recognizable pattern, except that sarcoma and carcinoma in the same organ occur most frequently in the uterus, as shown by 18 of the 35 cases listed in Table I.

DISCUSSION

From the foregoing presentation it seems apparent that cancer does not arise as an isolated cellular phenomenon, but rather as an anaplastic tendency involving many cells at once. The studies of "carcinoma *in situ*" demonstrate this for many epithelial areas, but of course it does not necessarily follow that all malignant tumors arise in this fashion. It is impossible to prove this for most tumors when they are seen clinically, because the early changes do not ordinarily produce any symptom that would call attention to the presence of a tumor, and by the time most of the lesions produce clinical findings they have obliterated all trace of their origin. The evidence at hand, however, is highly suggestive. Ewing remarks that in many tumors one can demonstrate cellular change toward the "precancerous" and preinvasive anaplastic cytological picture in areas outside of the limits of the frankly invading carcinoma. It is reasonable to assume that such areas of cellular change may occur at more widely separated points in an organ, and thus produce multiple tumors separated by areas of normal tissue.

That many neoplastic diseases are of multiple origin is fairly generally accepted. Such lesions as the lymphomas, multiple myelomas, Kaposi's disease, and the others discussed, commonly occur as multiple tumors. We have not been accustomed to think of the other, usually single, neoplastic lesions as being of this type, however. Yet the common finding of multiple skin cancers, and the listed cases of multiple tumors of the colon and breast show that even these lesions have such a tendency. It suggests that the etiological factor, whatever it may be, acts on all the tissues of one type, and may produce multiple anaplastic lesions of the mucosa of the colon, for example, or the epithelial lining of the urinary bladder. On the other hand, the multiple tumors that occur in different organs suggest a tumor diathesis in the individual, certainly a greater degree of susceptibility than can be explained away as mere coincidence or accident.

TABLE IV.—SOURCE OF CASES STUDIED IN THIS REPORT

	No. of cases
Warren and Gates	788
Hurt and Broders	71
Ohlman and Yardumian	3
Cashman and Cohen	4
Kretschmer	5
Schreiner and Wehr	307
Burke	46
Kirshbaum and Shively	25
Ralph Major	121
Mathe and Steiss	1
Counseller and Butsch	2
Paul Schneider	1
McCague	11
Jacox, Major and Baker	1
Shapiro and Bolker	1
Stalker, Phillips and Pemberton	60
Wood and Darling	4
Ward	94
J. W. White	2
Owen	143
Eisenstaedt	1
Friedman and Golden	1
Greenwood	13
Judd and Phillips	1
Mayo and Zellhoefer	1
Pemberton and Waugh	5
Smith, C. H.	1
Pierson, E. L.	47
Kilgore	37
Beilin	1
Bugher	30
Research and Presbyterian Hospital cases	40
Total	1,868

Heredity may play a part in the occurrence of these multiple tumors. In the series of cases reported by Hurt and Broders (15) there was a significant family history of cancer in 28.6 per cent. In the review of Stalker, Phillips, and Pemberton (36), a family history was derived in 26.6 per cent of their cases. Wood and Darling's report (41), mentioned previously, of a family with breast cancer in six generations with 4 bilateral cases is also suggestive.

Whatever the etiological background of multiple tumors may be, it seems definitely established that they occur more frequently than could be expected on the basis of chance alone. Such tumors will probably increase in frequency in the future as more and more cancer patients are cured and survive long enough to develop another tumor. This is one more reason for adequate follow-up on cancer patients.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Evans, J. P.: The Management of Wounds and Injuries of the Head. *J. Am. M. Ass.*, 1944, 124: 417.

The author divides the management of wounds and injuries of the head into four main sections: injuries to the scalp, injuries to the cranium, meningeal hemorrhages, and physiological and anatomic damage to the brain itself, either primary or secondary to disturbances caused by any one or more of the other divisions.

The injuries are described and the treatment of each is discussed. The author states that he is yet to be convinced that spinal drainage and the use of hypertonic solutions in the treatment of cerebral edema and contusions materially improve the patient's chances for recovery of his physical and mental well-being. EMIL C. ROBITSHEK, M.D.

EYE

Gillette, D. F.: A New Aid in Removal of Foreign Bodies of the Cornea: Topical Application of Silver Nitrate. *Arch. Ophth.*, Chic., 1944, 31: 129.

The author describes a new method of removal of foreign bodies from the superficial epithelium of the cornea. It is applicable to all foreign particles but is here chiefly concerned with the foreign bodies with an iron content which are encountered in industry. It consists of the topical application of 1 per cent silver nitrate before the removal of the foreign body. It is of value for the following reasons:

1. It facilitates removal of the foreign body, burn, and stain from the corneal epithelium.
2. It causes a minimum amount of trauma.
3. It conserves time and function.

The results indicate that the earlier the patient is treated the more successful is the method.

J. M. MORA, M.D.

Sorsby, A., and Hoffa, E. L.: The Sulfonamides in Ophthalmia Neonatorum. *Brit. M. J.*, 1944, 1: 353.

The authors discuss the value of sulfonamides in the treatment of ophthalmia neonatorum. In collaboration with Smellie, they had previously concluded from a series of 273 cases of ophthalmia neonatorum treated with sulfapyridine, compared with 46 cases treated with the usual classical local methods, that sulfapyridine therapy was so effective that it entirely replaced the old method of local therapy. Moreover, the results were as good in nongonococcal as in gonococcal ophthalmia.

The efficacy of sulfapyridine in gonococcal and in nongonococcal ophthalmia was confirmed in a more recent series of 258 cases of ophthalmia neonatorum, 133 of which were treated with sulfapyridine, 43 with sulfathiazole, 28 with sulfmezanthine, 31 with sulfadiazine, and the remaining 23 cases with several sulfonamides. Eighty-five and seven-tenths of the cases were cured within eight days; 29.9 per cent were cured within three days. The end-results were the same regardless of which of the four sulfonamides was used, but sulfadiazine was tolerated best and sulfapyridine was the most toxic. Cures were more rapid in the gonococcal type of ophthalmia. Within three days 51.7 per cent of the gonococcal cases and 23.2 per cent of the nongonococcal cases were cured. Corneal ulcers cleared up rapidly with little or no scarring. Purulent discharge, which continues even after the eight days of sulfonamide therapy, or the presence of a false membrane on the palpebral conjunctiva is treated with the usual types of antiseptics.

In this series an initial dosage of 0.25 gm. and a maintenance dosage of 0.125 gm. were administered at periods of every four hours, not only during the active phase of affection but also for three days after apparent clinical cure. Specific gonococcal cases responded more rapidly to sulfonamide therapy—90 per cent of all gonococcal cases and 84.3 per cent of the nongonococcal cases cleared within eight days.

Twenty-seven cases of inclusion bodies, 2 in association with organisms and 25 without organisms, responded well to sulfonamide therapy.

JOSHUA ZUCKERMAN, M.D.

Cashell, G. T. W.: Penicillin for Ocular Infections. *Brit. M. J.*, 1944, 1: 420.

The treatment of acute bacterial infections of the eye and of intraocular infections following injuries by the administration of penicillin is discussed. The author outlines the principles of treatment, the types of infection suitable for treatment, and the methods of application and dosage of penicillin; and he assesses the results obtained in a series of cases.

A solution of the calcium or sodium salt of penicillin may be instilled into the eyes; applied to the eyelids, conjunctival sacs, corneas or lacrimal sacs; or injected into the anterior chamber. Penicillin inhibits the growth of staphylococci and streptococci (staphylococcus pyogenes, the hemolytic streptococcus, the gonococcus, and the pneumococcus) even in the presence of pus.

The types of infection most suitable for treatment are as follows: acute conjunctivitis and blepharitis (usually associated with staphylococcus aureus, streptococcus, or pneumococcus), chronic blepharitis (usually due to staphylococcus aureus), infected corneal ulcers, and perforating injuries of the cornea with prolapse of the iris.

Penicillin may be used as a solution of 500 (Oxford) units per cubic centimeter for irrigation of the anterior chamber following perforating injury of the cornea, or for instillation into the conjunctival sac or as an ointment in a soft lanette wax base of 500 units per gram. In acute cases penicillin should be instilled at half-hour intervals for the first twenty-four hours, then every two hours, and later every four hours. Penicillin should be freshly prepared every fourteen days and stored in a refrigerator.

Results were assessed on the basis of clinical recovery and on cultures taken from the infected areas. In 20 cases of blepharitis, twelve days elapsed before the lids became clean and comfortable and the cultures became sterile. Relapse occurred in 2 cases and only slight improvement occurred in 1 case after treatment for twenty days. In 10 cases of acute conjunctivitis the eyes became normal and sterile cultures were obtained in ten days. In 10 cases of ulcer of the cornea healing of the ulcers occurred in nine days and the associated conjunctivitis cleared within forty-eight hours. In 14 cases of perforating injury with infection of the cornea and acute conjunctivitis the conjunctival sac became sterile within ten days. Three cases required excision as a result of chronic cyclitis. Irrigation of the anterior chamber in 2 cases prevented panophthalmitis. In 3 cases of dacryocystitis rapid response to treatment occurred and sterile, clean lacrimal sacs were obtained within from five to nine days. Primary healing followed dacryocystorhinostomy.

The method of treatment with a standard solution of 500 units of penicillin per cubic centimeter may be summed up as follows: for blepharitis instill 1 drop in each eye three times a day; for acute conjunctivitis use 1 drop every four hours during the acute stage, and 1 drop three times a day during the later stage; for corneal ulceration use 1 drop every four hours until the ulcer is clean, then three times a day; for perforating injuries use 1 drop every half hour during the first twenty-four hours and irrigate the anterior chamber with the solution.

In order to prevent relapse, it is advisable to continue treatment in all cases for seven days after the first negative swab, or after clinical evidence of cure.

JOSHUA ZUCKERMAN, M.D.

Sallman, L. von: Penicillin and Sulfadiazine in the Treatment of Experimental Intraocular Infections with Staphylococcus Aureus and Clostridium Welchii. *Arch. Ophth.*, Chic., 1944, 31: 54.

The study of the chemotherapy of intraocular infections of the anterior segment with the diplococcus pneumoniae was extended to similar infections with the staphylococcus aureus, which stands second to the first in frequency as the cause of post-traumatic and postoperative purulent endophthalmitis; and the clostridium welchii was selected as a representative of the anaerobe group. The effect of the oral administration of sulfadiazine in combination with the topical use of its sodium salt was again compared with that of local treatment with penicillin.

Following the treatment of staphylococcus-aureus infection, the course of the experimental endophthalmitis and the results of the treatment indicated that strain K had a higher animal pathogenicity than strain W and that infections with the first strain were more difficult to control by either type of chemotherapy.

Five of 23 eyes were saved by the combined oral and topical use of sulfadiazine. The other 18 eyes were destroyed by the infection. The condition in 1 of 12 eyes infected with strain K was cured by therapy with the sulfonamide compound.

Fifteen of 24 eyes were successfully treated by the local use of sodium penicillin. In 6 eyes the inflammation progressed from the beginning in spite of the therapy. The other 3 eyes were considered healed after treatment for three days, but the inflammation flared up about a week later. It could not be checked by renewed treatment with penicillin. The therapy was continued a few days longer in the succeeding series, and thereafter no relapses occurred. Nine of 12 eyes infected with strain K responded well. In 1 rabbit one eye was treated with sodium penicillin and the other with sodium sulfadiazine; in addition sulfadiazine was given orally in the usual dose. The eye treated locally with the sulfonamide compound suppurated; the infection in the penicillin-treated eye was checked.

In all 19 untreated control eyes of the penicillin series destructive purulent endophthalmitis developed. The infection cleared up in 1 of the 13 control eyes of the sulfadiazine series, which were influenced by the daily oral administration of 0.25 gm. of sulfadiazine per kgm. of body weight.

Penicillin therapy produced three times the number of good results as did the combined sulfadiazine treatment. This contrast would presumably have been even more striking if the period of treatment with penicillin had been extended a few days longer in the first group of experiments.

For clostridium welchii infection combined sulfadiazine therapy was used in 4 eyes and local penicillin therapy in 8 eyes. The second eye of each of the 12 rabbits was kept as a control. The clinical appearance of the eyes treated with the sulfonamide compound suggested a beneficial effect in 1 eye and no effect in 3 eyes. The inflammatory process in 1 of the treated eyes advanced more rapidly than that in control eye. No influence of the systemic treatment was evident on comparison of the control eyes of rabbits which received sulfadiazine orally with the control eyes of the animals not so treated. Three eyes of the penicillin series presented fewer signs of inflammation than their controls. The treated and untreated eyes of 3 other rabbits showed no differences, and in 2 rabbits the endophthalmitis appeared to have progressed further in the treated eyes than in the control eyes. The impression of a favorable effect of the treatment in 1 of 4 rabbits in the sulfadiazine series and in 3 of 8 rabbits in the penicillin series was not substantiated by the histological examination of the posterior segments of the treated

eyes. The infection had progressed behind the lens-iris diaphragm with the same intensity as in the control eyes despite the improvement of the endophthalmitis in the anterior segment.

At an early stage of the infection one eye of a rabbit in the penicillin series showed strikingly less infiltration and purulent exudate than the control eye after two days of treatment. On histological examination, the lens of this eye, as well as the lenses of all treated eyes, was found to have a large number of well stained, morphologically normal bacilli. It can be assumed, therefore, that the course of the infection was only delayed in this eye. No beneficial effect of the therapy was noticed in regard to the number or distribution of the bacilli and the extent of the infiltration in the lens.

The conclusions are:

1. Injections of various strains of staphylococcus aureus into the anterior chamber of the eyes of chinchilla rabbits with simultaneous injury of the lens produced a reliable standard lesion for chemotherapeutic experiments.

2. Combined oral and topical use of sulfadiazine was beneficial in 21.7 per cent of the eyes with purulent endophthalmitis produced by the aforementioned means when treatment was initiated from six to seven hours after inoculation.

3. Penicillin, applied topically with the first treatment from six to seven hours after inoculation, controlled the infection definitely in 62.5 per cent and possibly in 75 per cent of the eyes.

4. Intralenticular injections with the clostridium welchii caused destructive endophthalmitis.

5. Neither sulfadiazine nor penicillin therapy begun six hours after the intralenticular infection by the clostridium welchii had any effect on the resulting endophthalmitis. LESLIE L. MCCOY, M.D.

Sallmann, L. von, and Meyer, K.: Penetration of Penicillin into the Eye. *Arch. Ophth.*, Chic., 1944, 31: 1.

Sallmann and Meyer suggested the study of the penetration of penicillin into the anterior chamber of the eye because of the good results of penicillin in the treatment of some experimental intraocular infection of the anterior segment of the eye and the antibacterial activity of penicillin in vitro against most organisms found in intraocular infections.

Their investigations on its topical use dealt (1) with the entrance of penicillin into the aqueous of rabbits after iontophoresis as compared with that after the corneal bath, (2) with the influence of wetting agents on the penetration of it, and (3) with the possibility of its introduction by repeated use of solution or ointments with and without wetting agents. The studies on the systemic application are limited to determinations of penicillin in the blood, the spinal fluid, and the intraocular fluids after single intramuscular injections.

The authors give a detailed account of their technique and the results of their studies, and in conclusion they state:

1. The antibacterial activity of the aqueous in vitro served as the basis for the determination of the amount of penicillin in the anterior chamber of rabbits after various methods of local application of the sodium salt.

2. Comparison of the penetration of penicillin into the aqueous after the iontophoretic introduction with that following the corneal bath with and without wetting agents showed that the ionization method increases the concentration of the drug in the aqueous ten times as much as the corneal bath, and about eight times as much as the corneal bath with the addition of a wetting agent, aerosol 1 B.

3. After a single iontophoretic application of a solution of the sodium salt of penicillin, the aqueous exhibited an antibacterial activity for almost four hours; after a single corneal bath with a solution of the same concentration, the antibacterial activity continued little more than two hours.

4. Repeated applications of solutions and ointments containing penicillin did not produce any detectable antibacterial activity of the aqueous. The addition of wetting agents was without effect.

5. Small amounts of penicillin entered the aqueous from the blood stream. Secondary aqueous contained several times as much penicillin as primary aqueous. LESLIE L. MCCOY, M.D.

Stallard, H. B.: War Surgery of the Eye. An Analysis of 102 Cases of Intraocular Foreign Bodies. *Brit. J. Ophth.*, 1944, 28: 105.

Stallard analyzes a series of 102 cases of penetrating war wounds of the eye with retained intraocular foreign bodies—fragments of shells, hand grenades, and land mines.

Roentgenographic measurements of the missiles was done in the anteroposterior and lateral views.

Both eyes were injured in 30 cases, the left eyes in 34, and the right eyes in 41. In 56 cases the site of the penetrating wound was through the cornea, in 42 through the sclera, and in 3 cases the sites were multiple, and in 9 the site was not seen. The lower nasal quadrant of the cornea and the lower quadrant of the sclera had a high wound incidence.

Prolapse of the uvea occurred in 29 cases. Traumatic cataract developed in 50 cases; hemorrhages into the vitreous occurred most frequently in association with wounds in the sclera; prolapse of the vitreous was present in 4 cases of wounds of the sclera; and detachment of the retina occurred in 2 cases.

In 17 cases the foreign body was visible ophthalmoscopically. In 38 the particle was localized with x-rays, by means of a silver ring sutured accurately to the limbus.

Stallard prefers the posterior route for the extraction of the majority of war missiles which lie behind the lens, mainly because they are usually only slightly magnetic. This route permits access to the sclera at some site of election (close to the foreign body). Extraction of an irregular foreign body by this route is less damaging to the eye.

Extraction of the intraocular foreign bodies was performed by an electromagnet or by forceps introduced into the eye. In 73 cases this was accomplished by the posterior route, and in 32 cases of foreign bodies in the anterior chamber and lens, by the anterior route.

Visual acuity was improved in 23 cases, unchanged in 47, and decreased in 4. Evisceration was performed in 7 cases. Cataract extraction was done in 7 cases, and the correction with glasses was 6/6 in 1 case, 6/9 in 2 cases, 6/24 in 2, and 6/36 in 1. In another case the visual acuity was unknown.

JOSHUA ZUCKERMAN, M.D.

EAR

Suggit, S.: Deafness Resulting from Gunfire and Explosions. *J. Lar. Otol.*, Lond., 1943, 58: 313.

Gunnery and explosives in general can produce three clinical types of deafness: middle-ear deafness; a gradual high tone loss due to prolonged damage to the cochlea; and an abrupt high tone loss due to blast concussion. Combinations of these types can occur, and sometimes one ear will show one type and the other ear of the same patient another type. The material in this article is derived from 69 injured ears admitted as a consecutive series to a Royal Naval Hospital during a period of nine months.

In the middle-ear type of deafness, the most commonly recognized injury is a rupture of the ear drum with bleeding into the external auditory meatus. Several observers have noted that the margins of the perforation of the ear drum may be everted, and it has been suggested that this is caused by the suction component of the blast wave. The blast wave is a single pulse of increased pressure followed by a wave of suction, and the suction wave, though of considerably less magnitude, lasts three to five times as long as the pressure component. The hearing loss is essentially of middle-ear type with a negative Rinne. Frequently, however, there is evidence of additional injury to the cochlea in the form of a slight high tone loss. Provided the middle ear does not become infected by injudicious manipulations in the external auditory meatus, this type of deafness shows complete recovery in the vast majority of cases. The additional high tone loss from cochlear injury is unlikely to show any recovery.

Exposure to gunfire over a period of years produces a cochlear deafness with a gradually falling curve as the audiogram is read from the lower tones toward the high tones. In gradual high tone losses evidence of injury to the drumhead or middle ear is usually absent. Once the trauma from exposure to sound has lasted some length of time, the hearing loss is permanent. There is evidence that if a gradual fall of the whole audiogram curve has been produced with lowering of the upper tone limit, degeneration of the cochlea continues and results in a premature presbycusis.

A high tone cochlear deafness can be produced by a single explosion such as the muzzle blast of a high powered rifle. In this type of concussion deafness it is usual for the ear drum to be intact; rupture of the drumhead actually protects the cochlea from the full force of the blast wave and prevents the occurrence of concussion deafness. Of the series of 69 ears on which this article is based, 26 presented the concussion type of deafness with abrupt high tone loss. Only 2 of these showed evidence of rupture of the drumhead. Audiograms suggest that the deafness is immediate and does not alter to any degree with the passage of time.

In the type with gradual loss of hearing of the high tones a general degeneration of the organ of Corti occurs, and this is greatest in the basal coil of the cochlea. The evidence suggests that the process begins at the point in the basal coil which corresponds to a frequency of 4,000 cycles. In the type with abrupt loss of hearing of the high tones, the immediate and severe hearing loss over a circumscribed area, and the apparent subsequent stationary condition suggest a different type of lesion in the basal coil. It is possible that hemorrhages are much more circumscribed in the basal coil of the cochlea in blast concussion than in head injury.

The protection in general use in the Royal Navy is dry cotton-wool plugs in the external ear. In some of the cases reported, cotton-wool had been worn, and in others no protection had been worn. In none of the 3 clinical types does it appear to have made any difference in the trauma sustained. Somewhat greater protection is given by vaselined cotton-wool and various forms of rubber plugs. However well plugged the external auditory meatus may be, the protection is limited; moreover, effective plugging diminishes the ability to hear orders. If meatal plugs give only moderate protection against prolonged exposure to noise, the protection they give against a blast wave must be very little. Protection against airplane noise has been made more effective by the use of the high-altitude flying helmet, in which telephones form part of the protection. It is probable that the protection of gun crews can be improved by the development of an antiflash helmet containing telephones, which would give both the external auditory meatus and the side of the skull some degree of protection.

NOAH D. FABRICANT, M.D.

Pastore, P. N., and Meredith, J. M.: Chronic Osteomyelitis of the Petrous Pyramid with Extensive Extradural Abscess and Spontaneous Decompression. *Virginia M. Month.*, 1944, 71: 149.

The case reported by the authors represents disease of the petrous pyramid without the typical signs and symptoms of petrositis as described by Gradenigo. At the time the patient was hospitalized there had been no discharge from the involved ear for six to seven months. There had been no lateral rectus-muscle palsy at any time throughout the entire illness, and although at times the patient had severe left malar pain, she did not have the usual

retro-ocular pain of petrositis. Mastoidectomy was performed after a second attack of labyrinthitis.

Upon cessation of the discharge from the ear and mastoid wound, an abscess developed over the occiput. Subsequent events proved that the source of pus was the extradural abscess associated with chronic suppuration of the labyrinth and petrous pyramid. Upon removal of the extensive amount of thick granulation tissue overlying the dura and the establishment of adequate drainage for the pus, the headache and malar pain were completely relieved.

A second operation verified the diagnosis of a diseased labyrinth and osteomyelitis of the petrous pyramid, and permitted thorough eradication of the diseased bone. The gradual delayed development of, and subsequent recovery from, the facial-nerve paralysis, favor the theory that the edema contributed to the temporary loss of function of this nerve.

NOAH D. FABRICANT, M.D.

NOSE AND SINUSES

Wishart, D. E. S.: The Diagnosis and Treatment of Sinusitis in Children. *Laryngoscope*, 1944, 54: 97.

Attention is called to the importance of preserving the integrity of the inferior turbinate, the lining mucous membrane of the sinuses and nasal cavity with its cilia, and the regions of the ostia of the various sinuses for preservation of physiological function.

The diagnosis of sinusitis in children requires consideration of the following symptoms and signs: (1) frequently recurring colds in the winter season; (2) nasal obstruction, if constant or unilateral, or associated with redness of the nostril and upper lip; (3) nasal discharge; (4) continued or recurring nasopharyngitis; (5) protracted fever after a cold; (6) cough after going to bed, during the night, or on awakening; (7) postnasal drip in older children; (8) headaches in older children, and occasionally loss of sense of smell, conjunctivitis and swelling of the lids of one eye, mental dullness, and sometimes a broadening of the bridge of the nose.

During the course of a sinus infection, blockage at the ostium may lead to retention, destruction of cilia, ulceration, and further invasion of the mucosa.

Prolonged invasion of the underlying layers leads to chronic inflammatory changes, sometimes with abscess formation, which are irreversible and may require removal of the mucosa to cure the infection.

The spread of bacterial infection from the nose is the common etiology. Maxillary sinuses may be infected from the teeth or secondarily from wounds or fractures.

On examination significance is attached to:

The color of the mucous membrane, a purulent discharge before and after shrinkage, the use of the nasopharyngoscope, transillumination, roentgenographic films, and, if necessary, of radiopaque oils.

Instillation of radiopaque oils by displacement has been found impractical because of difficulty in interpretation and the necessity of three sets of films, taken before, at the time of, and seventy-two hours after instillation.

Allergy cannot always be differentiated by means of the history and local appearance alone. Two reliable indications are inability to relieve the intense blockage with shrinking agents, and an excessive eosinophilia of the nasal secretions.

Allergic symptoms have frequently cleared up promptly after elimination of infection of the antrum. Allergic conditions predispose to sinusitis through stasis of the secretions. Nasal polyps should be removed and infections cleared up.

Treatment of sinusitis must be adapted to the particular child. Measures found to be useful are:

1. Keeping the child's head raised on pillows and having the child lie on his side. The use of a steam kettle.

2. An infant may evacuate the nose by being placed face down and allowed to cry, by sneezing, or sometimes by aspiration with a soft bulb syringe.

3. The use of nose drops. The ingredients must not be harmful to ciliary action. The position of the head is most important. The extreme head-back or head-forward position is not recommended since the top of the nose is not the area to be treated. The lateral head-low position of Parkinson is recommended since it tends to shrink the middle meatus.

4. Nasal irrigation with warm isotonic solution, with the patient in the lying face-down position and kept there for a few moments afterward.

5. Aspiration and irrigation of the maxillary sinus, when necessary, should be done by puncture of the nasoantral wall. The natural ostium route is condemned because of probable injury at the ostium.

Treatments which are not recommended are: (a) displacement therapy, because of the tendency toward infection in healthy sinuses and the impracticability in children; (b) tampons or packs with such solutions as silver proteins, which damage the mucosa; (c) short-wave therapy; (d) x-ray therapy; and (e) dependence upon sulfa drugs alone.

Surgical procedures may be essential to recovery. The number of operations is very small in proportion to the number of children attended. Procedures which are condemned are coagulation, cauterization, and crushing or submucous resection of an inferior turbinate because of interference with physiological function.

Removal of polyps, antrostomy, a radical antrum operation, removal of the anterior tip of a middle turbinate, a partial ethmoid operation, an external ethmoid operation, or a frontal-sinus operation may occasionally be necessary, but the surgical measures adopted should always be as conservative as possible.

JOHN R. LINDSAY, M.D.

MOUTH

Birch, C.: Aberrant Molar Tooth in the Floor of the Nose. *Arch. Otolar.*, Chic., 1944, 39: 262.

A white male, thirty-nine years of age, complained of a profuse nasal discharge over a period of six

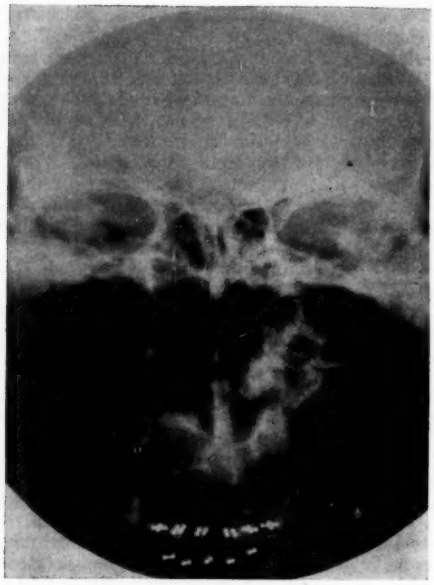


Fig. 1. Roentgenogram showing mass in hard palate.

months. Examination showed an ulcerated mass covered with pus and granulation on the floor of the right side of the nose. X-rays showed a mass 1.5 cm. in diameter embedded in the hard palate. Under anesthesia the mass was removed with a mastoid gage and it was found to be a complete second molar tooth. JOHN F. DELPH, M.D.

PHARYNX

Morgan, R. H., and Wepman, J. M.: The Cricopharyngeus Muscle in Esophageal Speech. *Laryngoscope*, 1944, 54: 55.

The laryngectomized patient is left with four possible means of communication: the use of paper and pencil, the pseudowhisper, the artificial larynx, and the esophageal voice. Of these four methods the esophageal voice is the most satisfactory both from the psychological and practical viewpoints since it requires no apparatus attracting attention to the patient's disability, and is always available. The quality of the voice varies in different subjects, but those who become proficient can carry on intelligible conversation without directing attention to the voice other than that due to its hoarse quality. The ability of nearly all patients to develop a useful pseudovoice after laryngectomy has been demonstrated in many cases in the past half century.

By employing methods useful for demonstrating the cricopharyngeus muscle by fluoroscopy and roentgenography, the authors made a series of observations on laryngectomized patients. The movements of the anatomical parts concerned with esophageal voice were analyzed under the fluoroscope and spot films made to record the various stages of speech. The function of the pharynx, cricopharyngeus muscle, and esophagus in the production of sound was demonstrated. The roentgenograms may be of assistance in the early training of patients for esophageal voice. NOAH D. FABRICANT, M.D.

SURGERY OF THE NERVOUS SYSTEM

PERIPHERAL NERVES

Holinger, P. H.: Post-Thyroidectomy Laryngeal Paralysis (Bilateral): Medical and Surgical Aspects. *South. M. J.*, 1944, 37: 169.

Bilateral vocal-cord paralysis following operations on the thyroid gland is not as infrequent as might be supposed. Six cases are reported with a discussion of the medical and surgical aspects.

Certain points are brought out which seem to be at variance with the usually accepted notions of interference with the recurrent laryngeal nerves. Loss of voice does not necessarily occur immediately, although sometimes the patients are completely aphonic or have a whispered voice immediately after surgery which may return to a voice which is almost normal within six months. The voice in such cases is said to be better with paralysis of both cords than of only one.

The diagnosis can be made only with a laryngeal mirror. A low tracheotomy should be performed and at a later date a lateral transportation of one or both arytenoid cartilages should be done. The main thing is that the voice should be preserved. This new supportive procedure on the arytenoids, as described by King, is evidently considered to be of considerable importance in this particular condition.

Associated with the extensive removal of gland tissue, during which the nerves are injured, there is often a thyroid deficiency following operation. This deficiency cannot be accurately estimated because of the restlessness and anoxemia of the patient. It is also inaccurate if the patient has a tracheotomy tube in place because of leaks around the tube. The control of thyroid deficiency must, therefore, be based on clinical response to therapy. Further, with extensive removal of the gland the parathyroid glands are apt to be included with accompanying signs of tetany and psychoses. It appears that the thyroid and parathyroid deficiencies are important secondary factors in obtaining a good functional result when an attempt is made to relieve the paralysis of the vocal cords.

In all, 6 cases are described and there are adequate tables emphasizing the points mentioned in the article. ADRIEN VERBRUGGHEN, M.D.

LeVay, A. D.: Sciatica: A Study of 40 Cases. *Lancet*, Lond., 1944, 246: 116.

The author investigated 40 servicemen for sciatica. None of these suffered from symptomatic sciatica caused by pelvic tumors or spinal metastasis. LeVay divided his cases in two groups: (1) those without neurological signs (12 cases), and (2) those with neurological signs consisting of weakness, altered sensation, and absent or decreased ankle jerk (28 cases). In 9 of these patients in whom the whole triad was found, a prolapsed disc was found either at operation or myelography. Seven of the prolapsed discs were lumbosacral and 2 were between the fourth and fifth lumbar vertebrae.

The author believes that the patients with nonneurological signs represent early cases of prolapsed discs. He states that the practical significance of this view is that disc prolapse need not be ruled out in the absence of neurological changes when there are a suggestive history and x-ray findings. These include sudden occurrence and stoppage of the pain, tilting due to nuclear prolapse which produces malalignment of a pair of vertebral bodies, and films in the extremes of lateral flexion which demonstrate a failure of the sides of a pair of vertebral bodies to approximate normally when flexion is toward the side of the protruded disc. DAVID IMPASTATO, M.D.

Ulmer, J. L., and Meredith, J. M.: The Syndrome of Cervical-Root Compression and Brachial Neuritis Following Lateral Herniation of the Intervertebral Disc. *Virginia M. Month.*, 1944, 71: 119.

In recent weeks attention has been drawn to the syndrome of herniations of the intervertebral disc in the cervical-rib region. Any help in the understanding of this problem of pain in the neck and in the arm and shoulders is welcome.

In this article 3 cases of pain in the arm and shoulder are reported. In 2 of the cases there was a typical small lateral herniation of an intervertebral disc with compression of the 8th thoracic nerve root and with radiation of pain into the middle and ring fingers of the affected sides. Movements of the neck and coughing and sneezing accentuated the pain.

However, it is pointed out that in these cases the most significant sign of the herniation was what was described as interlaminal tenderness on the affected side. Firm pressure over the lamina of the 2nd cervical vertebra on the left caused the excruciating pain to spread down to the dorsum of the hand. In 1 case lumbar puncture and descending lipiodol was used without obtaining any additional information. In the 2 other cases lumbar puncture was not performed, but one of these was of the kind previously reported in the literature as chondroma in the region of the neck and was mistaken for a spinal-cord tumor. However, a rather large herniation of the cervical disc between the 6th and 7th laminae was found. ADRIEN VERBRUGGHEN, M.D.

BRAIN AND ITS COVERINGS; CRANIAL NERVES

McConnell, A. A.: Prolonged Post-Traumatic Amnesia; Findings at Operation. *Lancet*, Lond., 1944, 246: 273.

The author is the first to report and suggest trepanation and subdural inspection purely on the grounds of prolonged amnesia following head in-

juries. In 5 of 6 cases a subdural effusion was found. Although subdural effusions have often been reported, they have not been credited as a cause of the post-traumatic amnesia which occurs in the early stages.

That increased intracranial pressure was not the cause of the prolonged amnesia is shown by a spinal-fluid pressure of not over 135 mm. of water in any case. The subdural fluid, however, was under increased tension.

At operation the cortex was compressed between 1 and 2 cm. beneath the dura. No arachnoid tears were visible at the trephined areas. In 3 cases the fluid had a protein content from 60 to 70 times higher than the spinal fluid which was within normal limits.

If the usual symptomatology suggestive of subdural hematomas, which is usually thought to occur with subdural effusions, had been sought, none of these patients would have been operated upon.

JACK I. WOOLF, M.D.

Merritt, H. H., and Brenner, C.: Normal Air Encephalograms in Patients with Convulsive Seizures and Tumor of the Brain. *N. England J. M.*, 1944, 230: 224.

The authors emphasize the fact that a pneumencephalogram or ventriculogram within normal limits does not exclude an intracranial tumor. This is shown by a study of 3 cases in which the possibility of a tumor was suspected because of convulsive seizures.

The normal encephalograms were found seven, twenty, and thirty months, respectively, after the initial convulsion. All 3 tumors were found to be astrocytomas at operation and were located in the left temporal, right motor, and right frontal areas.

JACK I. WOOLF, M.D.

Frostig, J. P., Van Harreveld, A., Reznick, S., Tyler, D. B., and Wiersma, C. A. G.: Electronarcosis in Animals and in Man. *Arch. Neur. Psychiat.*, Chic., 1944, 51: 232.

This work was done in an attempt to determine a safe basis by which the human brain could be exposed to an electric current for a long period of time for the purpose of electronarcosis. With adult dogs the initial state was induced with a current of 300 ma. of 60 cycle alternating current for thirty seconds and then reduced to about 50 ma. The initial state is somewhat similar to mild electric shock. After a few seconds of flexion the animal attained a state similar to decerebrate rigidity, which it maintained until the current was lowered. Respirations were abolished for a period of from 50 to 70 seconds. Cardiac arrest lasted only a few seconds, and the heart resumed its beating at a bradycardic rate for another minute, after which it fluctuated at a rate higher than normal.

A narcotic or a hyperkinetic state was produced in dogs, the former being more common. Either state could be maintained indefinitely.

In man, a lower induction current of from 150 to 250 ma. was used, with a maintenance current of from 45 to 90 after the first thirty seconds.

No definite form of electronarcosis could be elicited in human beings as was done in dogs, but rather a mixture of the two states with hyperkinetic symptoms predominant was produced. Usually the state could not be maintained for a period longer than about thirty minutes because of a return of cortical functions as indicated by intentional movements. However, there was no remembrance or unpleasantness associated with the procedure.

All acute effects produced during the electronarcosis were found to be completely reversible. No therapeutic effects were evaluated in this report; however, it is adjudged a feasible and safe procedure for clinical trial.

JACK I. WOOLF, M.D.

Weickhardt, G. D., and Watts, J. W.: Abscess of the Medulla Oblongata; Report of a Case. *Arch. Neur. Psychiat.*, Chic., 1944, 51: 282.

A survey of the literature shows that only 9 cases of localization of an abscess in the medulla oblongata have been reported. The data of these cases are tabulated and another case is added with this report. The present case concerns a man aged thirty-four who had a history of intermittent discharge from the right ear since childhood. Simple mastoidectomy had relieved an episode of mastoiditis and right facial paralysis, but was followed by recurrent paroxysms of meningitis. Radical mastoidectomy was done because of the persistence of these symptoms in spite of sulfonamide therapy. Several weeks later, signs of meningitis, petrositis, and dysfunction of the ipsilateral cerebellar hemisphere appeared. At this stage the diagnosis was osteomyelitis of the right petrous bone and diffuse purulent leptomeningitis, with suspicion of an abscess of the right cerebellar hemisphere. The cerebellar hemisphere was explored with the brain cannula but no abscess was encountered. The patient died suddenly the following day, and autopsy was performed with discovery of an abscess cavity in the region of the cerebellopontile angle. The abscess involved the right dorsolateral portion of the medulla and the right flocculus and extended upward into the lower portion of the pons. Osteomyelitis of the petrous portion of the temporal bone was present and direct extension from infection of the middle ear was clearly demonstrated.

Abscesses of the medulla oblongata reported in the literature present a heterogeneous clinical picture with the exception that they are invariably fatal. Slight variations in position and size of medullary abscesses produce remarkably different syndromes. The cavities tend to be elongated in the brain stem so that several levels or segments are likely to be involved. In only 3 of the 10 cases studied, the abscess was limited to the medulla oblongata. In the other cases the lesion could be followed into the upper cervical segments of the cord or into the pons. In 6 of the cases reviewed the abscess was of metastatic origin.

JOHN L. LINDQUIST, M.D.

Wolfson, L. E.: Rupture of a Left Temporosphenoidal Brain Abscess into the Ventricle. *N. England J. M.*, 1944, 230: 170.

Brain abscesses which rupture into the ventricle are probably always fatal; however, in this case the abscess probably ruptured into the ventricle, but the patient nevertheless recovered following the use of a high concentration of sulfadiazine.

This is a report of a sixty-three-year-old man who developed an abscess of the left temporal lobe secondary to mastoiditis. The abscess followed the usual course, and after a suitable time it was localized and drained and a culture of the staphylococcus aureus as well as of a nonhemolytic streptococcus was found.

A week after the drainage of the abscess through a catheter, lipiodol was inserted into the cavity. The lipiodol escaped into the ventricle and was seen in the posterior horn. This was taken to mean that the abscess, which had already been draining for a week, had ruptured into the ventricle. It is possible that this interpretation is not strictly provable. At the time of the accident the abscess was draining only rather thin fluid and it seems that the lipiodol was forced through the thin wall of the abscess.

ADRIEN VERBRUGGHEN, M.D.

Dublin, W. B.: Metastasizing Intracranial Tumors. *Northwest M.*, 1944, 43: 83.

Only 4 cases of intracranial tumors with metastasis were found in the literature.

The author reports a fifth case found at autopsy of a meningioma of the dura adjacent to the falx which had invaded the longitudinal sinus. Two metastatic nodules were found intrapleurally with only compression of the underlying lung tissue, while a third showed invasion of the pulmonary tissue. The metastatic nodules were identical with the intracranial lesion which was diagnosed as a fibrosarcoma of the meninges, grade 1.

JACK I. WOOLF, M.D.

SYMPATHETIC NERVES

Mufson, I.: The Mechanism and Treatment of Raynaud's Disease: A Psychosomatic Disturbance. *Ann. Int. M.*, 1944, 20: 228.

Six cases of Raynaud's disease are reported from the Department of Medicine, College of Physicians and Surgeons, Columbia University, and Presbyterian Hospital. All of the patients had the typical manifestations of the disease; they were all women, thirty-three years of age or less.

There is a discussion of the usual opinions with regard to Raynaud's disease, and a very convincing argument is produced to show that in spite of other supportive treatments, in 1 case including operation, the results of the treatment were not satisfactory until the environment and personal and social problems of the patient were satisfactorily adjusted.

The author believes that the unsatisfactory result in some cases of even the most extensive sympathectomy was due to the fact that the patient's personal and social problems were not properly adjusted. Certainly, these carefully recorded and intelligently discussed cases tend to confirm this view. Whether these cases were selected from this point of view it is hard to say, nor is any explanation given as to why the disease does not seem to recur following sympathectomy in the legs, in spite of social troubles. The conclusion is that Raynaud's disease is a psychosomatic disturbance. ADRIEN VERBRUGGHEN, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Nicholson, W. F., and Scadding, J. G.: Penetrating Wounds of the Chest; Review of 291 Cases in the Middle East. *Lancet*, Lond., 1944, 246: 299.

Now that the African campaign is over, it seems opportune to review the experience of a chest team in Egypt and Tripolitania from April, 1941 to May, 1943. In this article are discussed the methods of treatment used and the results obtained in 291 cases of penetrating wounds of the chest.

This varied experience has given the authors reasonable grounds on which to form an opinion that a chest team is best situated at a forward base hospital, to which patients can be evacuated as soon as possible and held until fit to move farther back. Patients from a long battlefront can be made to pass through a unit so placed, for no segregation of special types of case to any one CCS is possible in this type of warfare. Moreover, better roentgenological, theater, and nursing facilities at a base hospital help to outweigh any possible advantage of taking the specialist surgeon forward to the patient.

Usually, surgery in forward areas has been confined to closure of sucking wounds. In the early cases infection in the chest wall was often seen when sucking wounds had been tightly sutured. When the deeper layers were sutured firmly and the skin loosely stitched over a soft paraffin pack there was a great fall in the incidence of cellulitis of the chest wall. This form of closure of sucking wounds is the best solution of the problem of sealing an open pneumothorax while at the same time providing drainage of the chest-wall wound. There has been no difficulty in delayed primary suture of wounds which have remained clean; on the other hand, healing is often greatly delayed in infected wounds which break down after having been tightly sutured. Small entrance or exit wounds do not need excision unless complicated by comminuted fractures of ribs or bleeding from intercostal vessels. Compound fractures of the ribs or scapula require excision of the wound edges, removal of bone splinters, and trimming of the bone ends; in-driven fragments of bone in the lungs are in the authors' experience a far more potent cause of persistent hemoptysis in the earlier days and intrapulmonary suppuration later, than metallic foreign bodies.

Sulfanilamide is given by mouth as a routine mea sure. During evacuation it is impossible to ensure that four-hourly doses are given; therefore, now along the line of evacuation a dose of 2.5 gm. is given every twelve hours, and all patients in a convoy receive this dose at the same time.

In over half of the cases a hemothorax was present. At first it was treated as was suggested by Scadding (1941), with air replacement in cases in which a large aspiration was required during the first week. However, after a time it became clear that simpler methods were quite adequate. There is no doubt that, as Tudor Edwards has stressed, the sooner aspiration is performed the less the chance of infection, particularly when no foreign body, or only a small one, is retained. The danger of hemorrhage recurring as a result of a simple aspiration in the first few days has been exaggerated; unnecessary fear of this event had sometimes led to insufficient aspiration or inefficient attempts at air replacement before patients with large hemothoraces came under the authors' care.

They tried several methods with hemothorax. After routine complete air replacements were given up repeated simple aspirations were done, the procedure being stopped at once each time the patient complained of tightness in the chest, or as complete an aspiration as possible was done at one sitting, air being introduced only to prevent pain or discomfort from too low a pleural pressure. It was found that the patient's sensations, if he had been warned to say when his chest felt tight, were a perfectly adequate guide to a safe level of pleural pressure, so that manometry was unnecessary. If after the removal of about 500 cc. of blood the patient feels that his chest is "tight," from 50 to 100 cc. of air are introduced, to relieve the discomfort and permit the aspiration to be continued. A minor advantage of introducing a little air is that a fluid level is produced, which helps in roentgenological location of a residual pocket.

This policy of aspiration with minimal air replacement, or none at all, was found the best in the conditions under which the authors were generally working, i.e. they were receiving patients not less than forty-eight hours, and often very much longer, after wounding. In some of the cases in group 2, received less than forty-eight hours after wounding, complete air replacements were performed and a greater volume of air than the blood removed was deliberately introduced in a few, in view of the theoretical advantages of collapse of the lung by pneumothorax at this early stage. The immediate results were gratifying; but there were no means of comparing the results with those in which bleeding was stopped by pressure of the hemothorax itself, the latter not being aspirated until this result had been assured. It seems unlikely, however, that treatment by very early air replacement and the establishment of pneumothorax will ever prove practicable as a routine under battle conditions.

In a third of the cases the hemothorax was infected and eventually required drainage. This high proportion may correct prevalent notions about lack of sepsis in the desert. When infection was present there was a great variation in the time at which pus appeared and in the constitutional disturbance. The earliest day on which drainage was performed was the fifth, when an intercostal drain was necessary in

an infected hemothorax, already too thick for aspiration. The latest drainage was after two months for a bacillus-coli infection; in this case repeated aspirations constantly yielded a positive culture but pus did not form till the fifth week, and the patient remained afebrile throughout. Aspiration is repeated until definite pus appears; when this is too thick for easy aspiration an intercostal tube is inserted with water-sealed drainage. The drainage has remained airtight until rib resection was necessary. Stress has been laid on the danger of early rib resection in a pyothorax; there is no arbitrary time limit after which open drainage is quite safe. The pleural reaction to infection is much more variable in hemothorax than in postpneumonic empyema, and to assume that adhesions will be strong because the pus is thick is unwarrantable. The only safe way is for the anesthetist to be prepared in advance to control the lung if few adhesions are found.

When a pleural foreign body is present it should be removed at this stage, if possible. This sometimes requires more manipulation than simple rib resection allows. But on no account should adhesions be broken; the operation is for drainage, not primarily for the removal of the foreign body, which must be left if not readily accessible.

In 52 cases of infected hemothorax, uncomplicated by pulmonary or subphrenic suppuration, only 12 of the resulting empyemas are known to be healed; 29 were still under treatment when last seen, but many of these may now be healed. It was so often necessary to evacuate patients before treatment was completed that it is impossible to give figures for the final results. Only 1 thoracoplasty was performed. Deaths which were directly due to the empyema numbered 10.

In this series, 6 per cent of the hemothoraces were clotted; this is a rare condition. Why the blood in the pleural cavity does not clot is not clear, but mechanical defibrination by respiratory and cardiac movements probably plays a part. Certainly it is common for fibrin to separate from the blood and sink down to the costophrenic sulcus. Herein lies a common source of difficulty in aspirating a hemothorax. The beginner goes too low and his needle in the sulcus meets fibrin which keeps blocking it, whereas at a space somewhat higher the needle will be above the fibrinous sludge and a smooth aspiration will follow. Of 12 clotted hemothoraces for which operation was performed, 6 were infected and 6 uninfected; it is significant that a small foreign body was present in the clot in 3 of the uninfected cases.

When repeated aspirations have failed to empty the pleural cavity of blood, only a few cubic centimeters being withdrawn at each attempt, the possibility of a clotted hemothorax should be considered. If large, the sooner the clot is removed the better, and for this purpose a formal posterior thoracotomy along the sixth space, with resection of 1 in. of the sixth rib at the angle has been most satisfactory. Through this incision all clot can be removed, and small foreign bodies are not overlooked. Provided that an independent wound is made for the drainage-tube, usually with resection of an inch of rib, the wound heals by first intention. The pleural cavity is never closed without drainage, even when the clot is uninfected; to do so would doubtless be successful in a few cases, but the risk of chronic empyema makes it dangerous.

There were 65 cases of pulmonary contusion without gross hemothorax in the series. The degree of local bruising of the lung by the missile varied very greatly. With extensive pulmonary contusion the patient may be extremely ill with persistent hemoptysis, dyspnea, and cyanosis. The physical signs consist of dullness, often boardlike, on the affected side, usually with absent breath sounds, but without displacement of the heart or mediastinum. Roentgenographic signs consist of areas of opacity, not segmental or lobar in distribution, but sometimes very extensive, involving almost the whole lung. The condition is sometimes complicated by atelectasis, which can be recognized by the usual signs. The symptoms at the onset often call for oxygen therapy, which affords some relief to the cyanosis; the hemothorax patient, on the other hand, rarely needs oxygen since his dyspnea is relieved by aspiration.

There is very little information about the ultimate fate of pulmonary foreign bodies. Most surgeons advocate that large foreign bodies (2 by 1 cm.) should be removed; others, that they should be left till they cause symptoms; still others, that all larger than a pea require removal. There is no doubt that the lung tolerates metallic foreign bodies very well; this is not the case with organic substances, such as bone splinters and clothing.

When a foreign body is to be removed the surgeon must always ask himself which is the more dangerous —the foreign body or the operation for its removal? In the case of the lung this is no idle question. The easiest to remove are undoubtedly those in the periphery of the lung, from which they are best removed in two stages, as when dealing with a lung abscess. However, these are the foreign bodies that least often cause trouble, and if an abscess or hemoptysis arises later the condition can be treated by an operation no more severe than that required to remove the inoffensive foreign body. Thus a conservative attitude leads to the avoidance of many unnecessary operations, with their resultant loss of duty time. Central foreign bodies, or those near the mediastinum, are more dangerous. If they are left until complications arise the operation for their removal is likely to be hazardous, whereas if they are removed early in one stage there is but a slight chance of the development of empyema.

There were 25 thoracoabdominal wounds, but only 5 (with 3 deaths) were seen within twenty-four hours of the injury. The other 20 represented survivors past the CCS stage. The early mortality in these cases is high and the late morbidity heavy. A subphrenic abscess due to an infected hematoma often produces no roentgenographic evidence.

The importance of general measures in aftercare cannot be overemphasized. A high protein diet is required to replace the sometimes enormous loss of protein in purulent discharges. The vitamin-C requirement of patients with suppurating wounds is high, and attention to adequate intake of this vitamin is important. The hemoglobin should be maintained above the 80 per cent level, by blood transfusion if necessary, and respiratory exercises are of paramount importance both in convalescence from simple uninfected hemothorax and in empyema cases, in which they should be instituted at the earliest possible moment.

The gross mortality in the whole series over a period of from two to three months, and in most cases more, after coming under the care of the chest unit was 6.5 per cent. The exclusion of the thoracoabdominal wounds reduces the figure to 6 per cent.

Hospital mortality must obviously be grossly affected by the selection of cases arising from the delay between wounding and reception in the hospital. Thus in group 1 of the cases, received from one to three weeks after wounding, the hospital mortality was just under 4 per cent; in group 2, received after one or two days, it was 12 per cent; and in group 3, received after two or three days (usually after a long journey back), it was just under 8 per cent, which is probably fairly representative of the base hospital mortality of these wounds.

JOHN E. KIRKPATRICK, M.D.

TRACHEA, LUNGS, AND PLEURA

Schwartz, L.: Adenoma of the Trachea and the Bronchus. *Arch. Otolar.*, Chic., 1944, 39: 231.

An erroneous belief formerly existed that all primary endobronchial tumors are malignant, whereas recent knowledge discloses that from 5 to 10 per cent of such tumors are benign. The majority of benign tumors have sufficient common histological and clinical characteristics to be called "adenomas" and have a variety of synonyms such as polypoid adenomas, adenomatous polyps, carcinoids, benign epithelial tumors, and adenocarcinomas of low-grade malignancy.

The histological origin of such tumors is from the acinous cells of the submucosal tubuloacinous mucous glands and as the tumors grow they lift the mucosa over themselves to give the appearance of a smooth glistening surface. The symptoms are those of tracheal or bronchial obstruction and the differential diagnosis is chiefly concerned with bronchiogenic carcinoma.

Adenoma is overwhelmingly a disease of young women. Of 12 cases reported by Jackson and Konzelmann, 11 occurred in women; they usually occur between the menarche and the menopause.

The author reports 3 cases; in 2 the tumor occurred in the bronchus and in 1, which was unique, the tumor was located in the extreme upper portion of the trachea.

JOHN F. DELPH, M.D.

Goldstein, D. M., and McDonald, J. B.: Primary Pulmonary Coccidioidomycosis. *J. Am. M. Ass.*, 1944, 124: 557.

This article is the report of a follow-up study of 75 cases of benign, primary pulmonary coccidioidomycosis, and of 10 additional cases from a new endemic area. The first series of 75 patients developed the disease after a trip to Antelope Plains, California; the second group were exposed at Pallen Pass, near the California-Arizona border, which is believed to be a new endemic area. Most of the inhabitants of these areas have had the primary infection in their first year of residence.

In the group of 10 cases, symptoms appeared in from two to three weeks after exposure. Some of the patients developed a morbilliform rash, but aside from this feature, the condition was essentially similar to that observed in the larger series, except that the disease was more mild. In the larger series, 3 patients developed pulmonary cavities and 3 had pleural effusion. In the combined series, the common symptoms were thoracic pain and cough in 88 per cent of the cases. The cough was productive in 65 per cent and hemoptysis occurred in 18 per cent of the cases. Chills were experienced by 66 per cent of the patients, and invariably a low grade of fever was present. Slightly over one-third complained of sore throat, and 28 per cent had joint pains.

Physical examination revealed some positive findings in the chest in 26 per cent of the series. Erythema nodosum occurred in 19 per cent of the first 75 patients, and 2.6 per cent had erythema multiforme. Four patients in the second series had a morbilliform rash.

The most valuable laboratory aid in diagnosis was the coccidioidin skin test. All 85 patients gave a positive reaction. Blood precipitin, complement-fixation tests, and roentgenograms of the chest were valuable aids, and are to be discussed in detail in a separate study.

Therapy consisted mainly of bed rest, adequate fluids and diet, sedatives, and either salicylates or iodides for the arthralgia. Convalescent blood with high precipitin titer was administered to 2 patients; they showed immediate clinical improvement. Two coccidioidal verrucous granulomas developed in 1 patient and were widely excised with good healing. This treatment has apparently never been used before. Sulfonamides proved to be of no value.

Despite the high morbidity associated with the disease, all but 6 patients were returned to full duty in from three to four months. These 6 patients were reclassified to continental noncombat duty after a period of eight months. There were no deaths.

THOMAS F. THORNTON, JR., M.D.

Valle, A. R.: Thoracoplasty for Tuberculosis. *J. Thorac. Surg.*, 1944, 13: 36.

The end-results of 232 consecutive thoracoplasties for tuberculosis, done at Koch Hospital (St. Louis Municipal Tuberculosis Sanitarium) were presented. The results are based upon follow-up of all cases.

The cases are divided into three groups because the series extends over a period of ten years, and during this time there have been changes in the indications for thoracoplasty and in technique.

In group I (cases operated upon from 1931 to 1935) 58.7 per cent of the patients were benefited by thoracoplasty; in group II (1936–1938) 74 per cent were benefited; and in group III (1939–1941) 79.7 per cent were benefited. The total number of both early and late deaths has decreased from 35.8 per cent in group I to 20.2 per cent in group III. Also, the hospital stay has been reduced to one-half of what it was at first. J. M. MORA, M.D.

HEART AND PERICARDIUM

Strode, J. E., and Doolittle, S. E.: Chronic Constrictive Pericarditis. *Surgery*, 1943, 14: 847.

Chronic constrictive pericarditis is a disease caused by an inflammatory thickening and shrinking of the pericardium and characterized by a serious impairment of cardiac function. In this condition the heart is slightly or moderately enlarged and is in a fixed position. As a rule there is little or no evidence of pulsation on physical or fluoroscopic examination. Because of the inability of the heart to dilate adequately and to receive enough blood during the diastole, the venous pressure is markedly increased. The heart's contractions are also interfered with and the systolic blood pressure and pulse pressure are low. The liver is enlarged and there may be fluid in the pleural spaces and in the abdominal cavity. Edema of the lower extremities is less frequent, and signs of pulmonary congestion are generally absent.

Chronic constrictive pericarditis is a progressively crippling and invariably fatal disease. There is no medical cure, although rest, diuretics, and the removal of fluid from the pleura or abdomen may improve the condition temporarily. According to the available statistics, surgical treatment appears to have improved or cured 60 per cent of the cases. Brauer in 1898 was the first to advocate the resection of the chest wall over the region of the pericardium (cardiolysis), and the operation was performed by Peterson in 1902. Up to 1939 approximately 150 cases in which surgery was done were reported.

The operative technique is well known and consists essentially of adequate exposure and decortication of the heart. The right ventricle should be uncovered after the left has been freed to avoid acute pulmonary edema and cardiac failure.

After operation in 2 cases of chronic constrictive pericarditis the condition was apparently cured in one while in the other there was clinical improvement. CONRAD L. PIRANI, M.D.

ESOPHAGUS AND MEDIASTINUM

Yurasov, E. E.: Reconstruction of the Esophagus. *Am. Rev. Soviet M.*, 1944, 1: 206.

A dermatoesophagoplasty cannot be recommended in view of resulting frequent complications (formation of fistulas at the anastomosis of the skin tube with the stomach).

In reconstructing the esophagus, the colon has no advantages over the jejunum. The indications for such an operation are extremely limited.

Gastroesophagoplasty (either from the curvature or the whole of the stomach) is an extremely dangerous operation and has no positive aspects to recommend it.

The method of choice is the Roux-Gerzen technique as modified by Yudin. Yudin decided to bring the jejunum up to the angle of the inferior maxilla after dividing the mesentery of the jejunal loop. This solution to an exceedingly difficult technical problem permitted completion of the esophagoplasty in two stages. Yudin was able to anastomose the jejunal loop with the esophagus in the second stage. The Yudin technique also solved the problem of the functional approximation of the reconstructed esophagus patients were able to ingest solid foods without the aid of liquids. The passage of substances was apparent even when the patient was in a horizontal position. This peristaltic movement had been impossible with a skin tube. By bringing the jejunal loop up so high, the author was even able in one case to complete the esophagoplasty in one stage. Thus, instead of months, the complete esophagoplasty required only two and a half hours and on the tenth day the patient was able to be fed orally. A single-stage esophagoplasty, however, is not recommended and can be performed only when the patient is in good physical condition and when the surgeon is fully confident of the viability of the jejunal tube. Not only has more than one patient been lost because of necrosis of the jejunal loop but other complications have been encountered as well.

Thirty-eight esophagoplasties have been performed by bringing the jejunum up to the clavicle. In 14 of these cases the cervical segment of the esophagus was anastomosed with the jejunum. Only 4 of 38 patients were lost. One died of asphyxiation in the interval between steps as a result of scar stenosis of the gullet, having refused tracheotomy; the second died of mediastinitis and empyema of the pleura after the second stage of the operation—the forcible bringing-up of the esophagus to the clavicle; the third died of rapidly progressive debilitation; and the fourth, a child, died during one of the minor steps in the operation.

The completed method of esophagoplasty employed in the last three years may be divided into two stages. The first phase, mobilization of the jejunal loop, is performed under spinal anesthesia. A section of the jejunum, from 30 to 40 cm. long, is divided between the vermiform appendix and the umbilicus. After the main artery supplying it is determined, the other branches (often 2 or 3) are ligated. This requires special attention. An incision is made into the peritoneum near the root of the mesentery and above the artery which is then freed from its surrounding cellular tissue. The exposed artery is retracted and then ligated. The exposure of its coats between the layers of the mesentery relieves the tension usually found

when one is working on these vessels. The jejunum is usually mobilized about 15 or 20 cm. from the duodenojejunal fold. This, however, depends upon the position of the artery supplying the loop to be mobilized.

In the next stage, one of two techniques may be used. In the first variation, the jejunal loop is isolated, i.e., it is resected and its upper (oral) end is brought through the incision and placed in a subcutaneous tunnel extending to the angle of the left inferior maxilla, where it is fixed on a gauze pad. The proximal end of the isolated jejunum is anastomosed with the stomach by an end-to-side anastomosis either anterior or posterior to the transverse colon.

In the second variation, it is not necessary to isolate the loop from below, for immediately after it is divided, the proximal end is anastomosed in a y-anastomosis as far as possible below the loop so as not to hinder its mobilization. In this variation there is no need to make a side-to-side anastomosis of the loop with the stomach. Roentgenoscopic observations have disclosed that when such an anastomosis has been made, contrast substances have been ingested directly into the intestine and have by-passed the stomach. Patients operated on without anastomosis have been restored to health in the course of several years (up to six years). In follow-up examinations they had no complaints and stated that they did not experience any digestive disturbances despite the fact that they were limited to purely jejunal digestion. The author's colleagues, Petrov and Bocharov, have made numerous studies of these patients because of the peculiar condition of their digestive tract and have reported no grave disturbances.

Yudin has also designed a very effective instrument for completing the jejunal manipulation and preparing an anterothoracic subcutaneous tunnel to the angle of the left inferior maxilla. It is heart-shaped, with curved edges and a long handle. After it has been introduced, the tunnel is packed with gauze which is permitted to remain for some time to stop any hemorrhage. The tunnel is not opened at the clavicle. A straight suture needle threaded with silk is inserted obliquely through the raised skin and introduced downward into the thoracic wound. The jejunal loop is fastened to the thread and is carefully brought up through the tunnel and just as carefully placed along its length. After the thoracic wound has been sutured, the jejunal loop remains covered by the skin all the way up to the clavicle. Under the earlobe the proximal end is fastened to a gauze pad by thread. If the surgeon has decided to anastomose the loop with the stomach, he should now do it immediately as postponement of this process to another stage of the operation is not advisable. Experience has proved how complicated this step may become later on and how difficult the postoperative period sometimes is for the patient.

The second and final stage of the operation consists in bringing up the esophagus to the clavicle and anastomosing it with the jejunal loop. This may be done by side-to-side anastomosis of the esophagus with the jejunal loop or by turning the esophagus and doing an end-to-side anastomosis. In order to obliterate the original esophagus immediately beneath the anastomosis, the method of choice is side-to-side anastomosis.

CHARLES BARON, M.D.

Adams, W. E., and Bloch, R. G.: Hemangioma of the Mediastinum; Report of a Case. *Arch. Surg.*, 1944, 48: 126.

Hemangiomas are frequently seen in various tissues in the body, but only 1 case has been reported up to this time in which the tumor was in the medi-

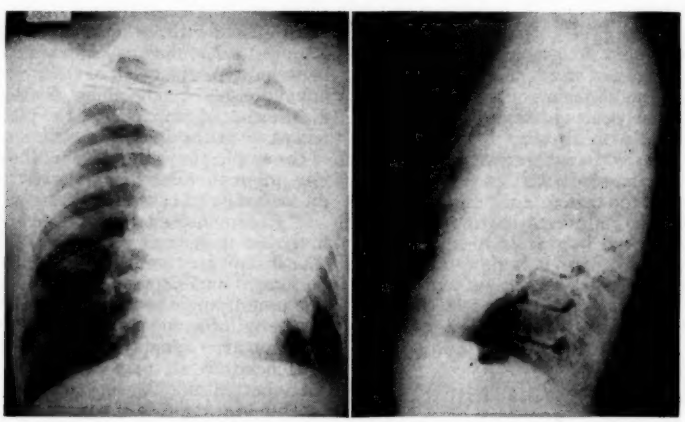


Fig. 1. Preoperative roentgenograms of the chest showing tumor extending outward from the anterior mediastinum. Note circular opaque shadow (calcified phlebolith) in line with the left second rib anteriorly. Iodized oil is seen in the left lower pulmonary field.

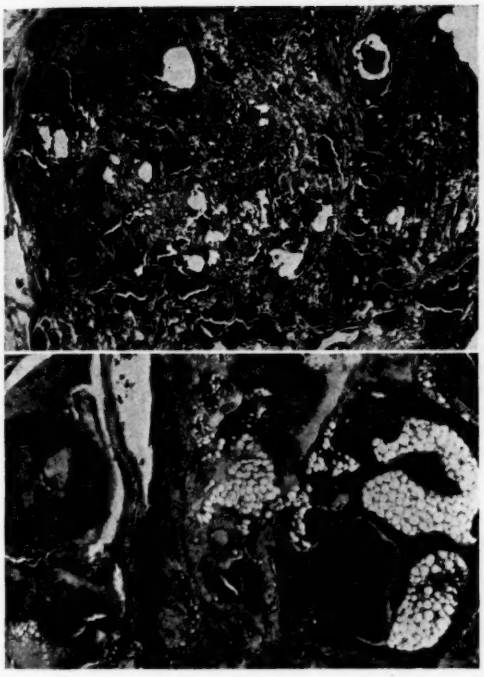


Fig. 2. Two magnifications of microscopic sections of tumor. Note numerous large blood spaces distributed throughout the connective tissue framework. A phlebolith and bone containing marrow are seen in the higher magnification.

astinum. This was a malignant hemangioendothelioma in a man.

The present tumor, removed at operation, weighed 527 gm. and measured 18 by 10 by 5 cm. The surface was covered by a smooth, soft, thin capsule, through which could be seen many dilated vessels. The freshly cut surfaces appeared cavernous. Many of the sinuses were filled with dark blood clots. Several calculi were also present. Microscopically, there was no evidence of malignancy. The final diagnosis was hemangioma of the mediastinum. The patient recovered. The case is reported in detail.

SAMUEL KAHN, M.D.

MISCELLANEOUS

Rosenblatt, M. S., and Bilderback, J. B.: Absence of Half of the Left Diaphragm. Case Report. *Am. J. Surg.*, 1944, 63: 411.

Congenital diaphragmatic hernia is a fairly common lesion in infancy. This report concerns a two-month-old white male with a large diaphragmatic hernia, the result of an interesting and unusual anomaly. Ever since birth the infant had been able to

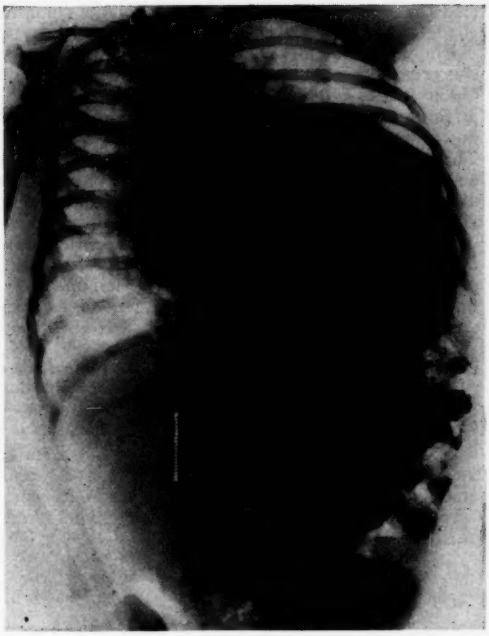


Fig. 1. Stomach filled with barium shown in left thoracic cavity.

take only 2 oz. at a feeding because cyanosis developed if larger amounts were fed. Respirations were shallow and rapid. Examination of the chest demonstrated a shift of the heart to the right, and tympany with absence of breath sounds over the entire left chest except at the apex. X-ray studies visual-

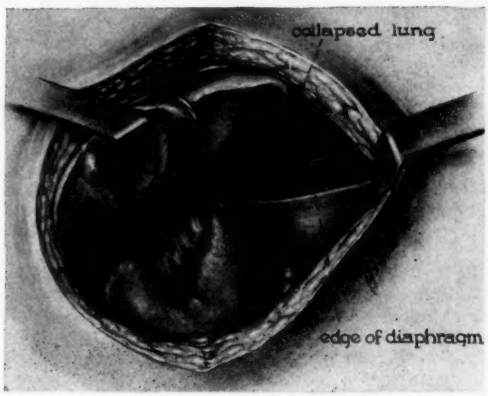


Fig. 2. Congenital absence of portion of diaphragm; appearance at operation. (Courtesy of American Journal of Surgery.)

ized the stomach and splenic flexure of the colon in the left thoracic cavity.

Under general anesthesia the left phrenic nerve was crushed in the neck and a transabdominal repair of the hernia was performed. The stomach, spleen, large bowel, and a considerable portion of the small bowel were withdrawn from the left pleural space. The entire anterior portion of the left diaphragm was then found to be absent. The free edge of the diaphragm was sutured to the anterior thoracic and abdominal wall. Recovery from the operation was uncomplicated and the repair has maintained satisfactory separation of the pleural cavity from the peritoneal cavity. The authors have been unable to find a report of the successful treatment of such an anomaly. THOMAS F. THORNTON, M.D.

Bennett, T. I., and Parkes, T.: Penicillin in Sulfonamide-Resistant Pneumonias: with Special Reference to Staphylococcal Infection and Empyema. *Lancet*, Lond., 1944, 246: 305.

A group of 4 cases of staphylococcal pneumonia, 2 of streptococcal empyema, and 1 of staphylococcal empyema are described. Of these cases, 6 were wholly resistant to sulfonamide therapy, and 1 was partially resistant.

All were treated with penicillin, and all were cured completely. One of the most remarkable properties of penicillin is its capacity to act in the presence of large quantities of pus and bacteria, and its use by local injection in empyema may prove revolutionary in the treatment of this condition. Some systemic treatment is probably also necessary in these cases, to prevent reinfection from neighboring tissues.

SAMUEL KAHN, M.D.

Clagett, O. T., and Hausmann, P. F.: Huge Intrathoracic Fibroma: Report of a Case. *J. Thorac. Surg.*, 1944, 13: 6.

A fibroma, filling three-fourths of the right side and a third of the left side of the thorax and densely adherent to the mediastinum, thoracic wall, and collapsed lung, was removed successfully. The engorgement of the veins of the arms and neck from which the patient had suffered disappeared immediately after operation.

It was found that for some time after operation the blood pressure remained low. It was believed that this hypotension, which had none of the features of shock, was a result of the release of pressure by the tumor on the great vessels of the thorax and the consequent circulatory readjustment.

SURGERY OF THE ABDOMEN

GASTROINTESTINAL TRACT

Davis, H. A., and Bauer, F. K.: Vitamin-B_1 Nutrition in Surgical Patients Determined by the Blood Level of Pyruvic Acid. Hepatic Disease. Thyroid Disease. Renal Disease. Neoplastic Disease and Infection. *Arch. Surg.*, 1944, 48: 185.

In 28 of 32 patients suffering from various forms of liver disease, vitamin-B_1 deficiency was present as revealed by elevated blood levels of pyruvic acid. Reduction of hepatic function appeared to be the most significant etiological factor underlying the elevation of the pyruvic acid. After the intramuscular injection of a standard dose of thiamine chloride the pyruvic-acid level was diminished both in normal individuals and in patients with hepatic disease. In the latter group the reduction was less marked when liver function was impaired. Diminished hepatic function is believed to be a primary factor in inducing a state of vitamin-B_1 deficiency because of a diminished capacity for phosphorylate vitamin B_1 and the inability to render it available for use by the tissues.

The nutritional status with respect to vitamin B_1 of 23 patients with thyroid disease was studied and contrasted with that of a control series. The 16 patients who suffered from hyperthyroidism showed elevated blood levels of pyruvic acid. The administration of a strong solution of iodine U.S.P. alone resulted in definite reduction of the pyruvic acid in the blood, as did the use of this solution and of vitamin B_1. Subtotal thyroidectomy may induce, temporarily, an increased need for this vitamin, as revealed by postoperative elevation of the pyruvic-acid blood level.

In 11 patients with renal disease the pyruvic-acid level was not increased even though azotemia was present in many instances. In a group of 19 patients suffering from malignant neoplastic disease it was found that vitamin-B_1 malnutrition might occur in the absence of fever and obvious malnutrition, although high pyruvic-acid blood levels were more likely to occur when fever and malnutrition were associated. In 18 of 38 persons suffering from various types of infection and fever, vitamin B_1 malnutrition was revealed by increased blood levels of pyruvic acid.

WALTER H. NADLER, M.D.

King, H. E., Comfort, M. W., and Osterberg, A. E.: The Effect of Atropine Sulfate, Morphine Sulfate, Pilocarpine Hydrochloride, Prostigmine Methylsulfate, Sodium Salt of Dehydrocholic Acid, and Secretin on the Gastric and Duodenal Secretions of Normal Persons When Fasting. *Am. J. Digest. Dis.*, 1944, 11: 31.

The method of continuous aspiration of gastric and duodenal contents has been applied in the study of volume and *p*H of the gastric and duodenal contents.

The volume and *p*H of the gastric and duodenal contents have been determined without, and after, the administration of atropine sulfate (1/100 gr., or 0.00065 gm., subcutaneously), morphine sulfate (1/6 gr., or 0.01 gm., subcutaneously), pilocarpine hydrochloride (1/10 gr., or 0.006 gm., subcutaneously), prostigmine methylsulfate (1 mgm. subcutaneously), sodium salt of dehydrocholic acid (10 cc. of a 20 per cent solution intravenously), and secretin (1 clinical unit per kilogram of body weight, intravenously). Two types of observation were carried out. In the first the gastric and duodenal contents were aspirated simultaneously but separately; in the second the gastric contents were allowed to enter the duodenal cavity and the mixed gastric and duodenal contents were aspirated.

In observations in which gastric and duodenal contents were aspirated separately and no drugs were given, the mean volumes of duodenal and gastric contents for twenty-minute periods were, respectively, 6.1 and 23 cc. The mean *p*H of the duodenal contents was 7.6 and of the gastric contents 1.6 in the same type of observations.

In observations in which the gastric contents were allowed to enter the duodenum and the mixed gastric and duodenal contents were aspirated, and no drugs were given, the mean volume of the duodenal contents for periods of twenty minutes was 29 cc., and the mean *p*H of the duodenal contents, 5.53. In spite of continuous aspiration of the duodenal contents, the acid gastric juice apparently remained in the duodenal cavity long enough to stimulate the hormonal mechanism controlling the secretion of bile and pancreatic juice and raise the mean *p*H values of the gastric contents to levels well above those (1.81) found when the duodenal and gastric contents are aspirated separately and then mixed.

In observations in which the gastric and duodenal contents were aspirated simultaneously but separately, the volume of gastric contents was markedly decreased by both atropine sulfate and morphine sulfate, was apparently unaffected by sodium salt of dehydrocholic acid, but was increased both by pilocarpine hydrochloride and prostigmine methylsulfate. The *p*H of the gastric contents was elevated by atropine sulfate and by pilocarpine hydrochloride during the first hour after stimulation, and was unaffected significantly by prostigmine methylsulfate and the sodium-salt of dehydrocholic acid.

In the observations in which the gastric and duodenal contents were aspirated simultaneously but separately, the volume of duodenal contents was decreased by both atropine sulfate and morphine sulfate, was practically unchanged by pilocarpine hydrochloride, and was increased by prostigmine methylsulfate, the sodium salt of dehydrocholic acid, and secretin; the *p*H of the duodenal contents was unchanged by atropine sulfate, pilocarpine hydro-

chloride, prostigmine methylsulfate, and the sodium salt of dehydrocholic acid, but it was increased by secretin.

In observations after drugs were given in which the gastric contents were allowed to enter the duodenum and the mixed gastric and duodenal contents then were aspirated, the volume was decreased by atropine sulfate and morphine sulfate and increased by pilocarpine hydrochloride, prostigmine methylsulfate, the sodium salt of dehydrocholic acid, and secretin; the mean values for *p*H were lowered slightly by pilocarpine hydrochloride and were elevated slightly by atropine sulfate, prostigmine methylsulfate, the sodium salt of dehydrocholic acid, and markedly by secretin.

Atropine sulfate reduced both the amount of acid secreted and which entered the duodenum, as well as the buffering value of the duodenal contents, but its action on the secretion of acid was apparently greater than its effect on the secretion of bile, pancreatic juice, and juice of the duodenal mucosa. The result of its action was a higher average *p*H of mixed duodenal and gastric contents when the gastric contents were allowed to enter the duodenum, and the mixed gastric and duodenal contents were then aspirated.

Morphine sulfate reduced the volume of the contents of the stomach and of the duodenum promptly and markedly. This drug usually caused bile to disappear completely within twenty minutes from the duodenal contents and to remain absent for from three to four hours or more in the fasting subjects who had intact biliary tracts and normally functioning gall bladders. Glyceryl trinitrate and amyl nitrite did not reduce the duration of the time during which bile was not found in the duodenal contents. The failure of glyceryl trinitrate and amyl nitrate to induce a flow of bile suggests that their action, in reducing the intraductal pressure induced by morphine sulfate in cases in which a T-tube is in place in the common bile duct and the gall bladder has been removed, may be due to something more than a relaxing effect on the sphincter mechanism with a flow of bile into the duodenum.

The sodium salt of dehydrocholic acid in the dosage given seemed capable of provoking a flow of bile great enough to elevate slightly the *p*H of the fasting gastric and duodenal contents aspirated already mixed, while secretin in the dosage given was capable not only of provoking a secretion of pancreatic juice great enough to raise the mean pH to higher levels than ordinarily found or reached after any of the other drugs, but of maintaining the value for *p*H at, or more than, neutrality for more than two hours in spite of the entrance of some acid from the stomach into the duodenum. Comparison of the effectiveness of the two drugs in altering the *p*H of the combined gastric and duodenal contents clearly shows that secretin is far more effective than the sodium salt of dehydrocholic acid in elevating the *p*H of the duodenal contents during the period of fasting.

The action of atropine sulfate, the sodium salt of dehydrocholic acid, and secretin in raising the mean *p*H of the duodenal contents (gastric and duodenal secretions) during fasting affords a rationale for the use of these drugs in the treatment of peptic ulcer at least during the fasting hours. The clinical value of atropine sulfate in elevating the abnormally low *p*H of the contents of the duodenum of fasting patients who have duodenal ulcers should be critically examined. The intravenous method, and the cost, of administration of the sodium salt of dehydrocholic acid and of secretin, and the possible reactions after the use of "purified" secretin, limits their practical application for this purpose at this time. The oral use of bile salts has been suggested in the treatment of peptic ulcer, but the relatively small changes in *p*H of the mixed duodenal contents produced by the intravenous administration of the sodium salt of dehydrocholic acid indicates that the clinical value of bile salts given either orally or intravenously would be small. The marked and prolonged action of secretin in elevating the *p*H of the duodenal contents in the observations in which the acid gastric contents were allowed to enter the duodenum and the combined gastric and duodenal contents were aspirated already mixed invites the preparation of a cheap supply of secretin safe for repeated administration, and a study of its possible value in the treatment of duodenal ulcer.

Eckhoff, N. L.: Gastric Mucosal Hypertrophy Causing Intussusception and Acute Pyloric Obstruction. *Guy's Hosp. Rep.*, Lond., 1943, p. 38.

A case is reported of benign hypertrophy of the gastric mucosa of such degree that it prolapsed through the pylorus and produced an intussusception which extended almost to the duodenojejunal flexure and resulted in acute and complete pyloric obstruction.

The possible relation between this and other benign lesions of the stomach is discussed.

EDWARD W. GIBBS, M.D.

Lahey, F. H.: Total Gastrectomy, Splenectomy, Resection of the Left Lobe of the Liver, Omentumectomy, and Colectomy on One Patient in One Operation. *Ann. Surg.*, 1944, 119: 222.

The author reports the removal of the stomach, left lobe of the liver, spleen, omentum, and entire colon at one operation in a sixty-six-year-old patient with Hodgkin's disease of the stomach. At the time of operation the lesion was thought to be carcinoma.

The operation was performed under continuous fractional spinal anesthesia in a period of two and one-half hours (Fig. 1).

Three months after this procedure the Mikulicz anastomosis of the lower sigmoid and terminal ileum was closed. This patient died two months later with recurrence of the malignancy.

The author believes that this extensive procedure was not justified in view of the short survival period of the patient, but the successful technical accom-

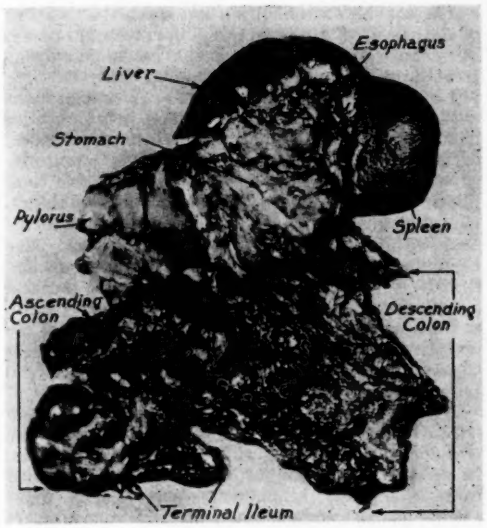


Fig. 1. Photograph of the gross specimen of the composite mass of viscera removed. (Courtesy of J. B. Lippincott Co.)

plishment of the operation illustrates the progress in modern anesthesia and surgical methods.

EDWARD W. GIBBS, M.D.

Dixon, C. F.: Anterior Resection for Carcinoma Low in the Sigmoid and the Rectosigmoid. *Surgery*, 1944, 15: 367.

Anterior resection has the advantage over other surgical methods employed in the radical removal of malignant lesions of the sigmoid in that the continuity of the bowel is re-established and a permanent colonic stoma is obviated. In the author's opinion the results obtained compare favorably with those of other methods.

The spread of carcinoma of the rectosigmoid usually is upward, and the superior hemorrhoidal vessels may be sacrificed without apparent impairment of the circulation to the rectosigmoid or rectum.

Dukes, C. E.: The Surgical Pathology of Rectal Cancer. *Proc. R. Soc. M.*, Lond., 1944, 38: 131.

The general object of this article, based on watching the progress of more than 1,000 cases treated by excision of the rectum, is to define as precisely as possible the significance of each fact observed during the naked-eye and microscopic examinations of operative specimens of cancer of the rectum. There were two ways of assessing the significance of the phenomena observed: (1) by recording how often they occurred, and (2) by watching their influence on survival after operation.

Were the results of surgical treatment the same whether the cancer was situated in the lower third, the ampulla, or the upper third of the rectum? The author followed up 370 cases treated by a combined operation (abdominoperineal or perineoabdominal) during the years from 1930 to 1939. This analysis showed that for cases without glandular metastases the results of surgical treatment were approximately the same whatever the situation of the primary growth, but for cases with glandular metastases the results varied to some extent with the position of the malignant growth in the rectum. For cancers with lymphatic metastases situated in the rectal ampulla the results of surgical treatment were not so good as for growths of a similar stage of development in the upper and lower third of the rectum. No doubt this is due to the fact that lymphatic spread from ampullary growths is more likely to pass laterally along the course of the middle hemorrhoidal vessels, but this cannot be a frequent occurrence because the difference in the survival rate of patients with growths in different regions of the rectum is slight. Judgment should be reserved till a larger series of cases have been observed over a longer period, but most likely in the end the figures will show that the worst place to have a rectal cancer with lymphatic metastases is in the rectal ampulla.

The size and surface area of a rectal cancer are of less importance than might be anticipated. A very early growth is most likely to be small and a very advanced growth may be large, but there is no direct relationship between the surface area and the extent of lymphatic or venous spread. A small shallow ulcer of high-grade malignancy may have spread far and wide in lymphatic and venous channels, whereas a fungating growth of much larger dimensions may still be localized to the submucosa and rectal muscle. Shape is of more importance than size. Protuberant growths are often of a low grade of malignancy and tend to metastasize late. On the other hand, deep ulceration is usually a sign of deep penetration into the perirectal tissues and indicates a greater probability of lymphatic metastases.

A rectal cancer seems generally to enlarge equally in all directions superficially from a central focus in the mucous membrane, but as a rule the lateral surface spread in the transverse axis proceeds faster than the upward and downward spread in the long axis, which accounts for the oval shape. The limits of the growth within the submucosa are often a little wider than in the mucous membrane, but apart from this, it is rare to find any extension within the rectum itself, either above or below the margin of the surface growth. This fact is of importance in cancers of the upper third of the rectum treated by perineal excision, because in cases without lymphatic metastases this operation has often proved satisfactory even when it was possible only to get just above the growth.

The passage of cancerous emboli along the hemorrhoidal veins may give rise to hepatic metastases and so it is natural to ask if any information as to whether or not this disaster has occurred can be obtained by the dissection of the veins in an operative

specimen. It is of course obvious that an embolus composed of cancer cells might travel up the hemorrhoidal vein without leaving any trace behind. This being so, the latent existence of hepatic metastases cannot be excluded because nothing is found in the veins of the operative specimen; but in some cases a solid clump of cancer cells can be demonstrated in the hemorrhoidal vein or one of its tributaries when the vein is dissected. As a rule such an intravenous extension remains in continuity with the primary growth and appears as a rootlike process pushed out for a variable distance along the lumen of the vein as though along the path of least resistance. More than 1,000 operative specimens of rectal cancer were examined for the presence of cancer cells in the hemorrhoidal vein or its tributaries and the type of intravenous spread just described was found in 17 per cent. It occurs with equal frequency in all regions of the rectum, and although more common in advanced growths with lymphatic metastases, it may be found also in tumors at an early stage of development. The more rapid the growth, the greater the likelihood of venous spread. A full postmortem examination in 63 patients who died within a week or two of excision of the rectum revealed in 20 a malignant growth in the hemorrhoidal vein or one of its tributaries. Hepatic metastases were found in only 10 of these 20 cases. It became clear that no certain forecast of hepatic metastases can be made from the finding of a malignant growth in the hemorrhoidal vein, although it is undoubtedly true that hepatic metastases are more common in cases with demonstrable venous spread.

There is an amazing variability in the number of lymphatic glands found during the dissection of operative specimens of rectal cancer. In rectal cancer the stimulus to proliferation of lymphoid tissue appears to be septic absorption and this depends chiefly on the surface area of the malignant ulceration. The cancerous tissue itself appears to exert little, if any, stimulus to the production of new lymphatic glands. Invasion of lymphatic glands by cancerous growth does not act as a stimulus to the formation of new glands on an appreciable scale.

Passing from the number of glands to the much more important question of lymphatic metastases, we find here also a surprising variability. There is a close relationship between the histological grade of the primary tumor and the presence of lymphatic metastases. Metastases are comparatively rarely found in well differentiated growths of a low grade of malignancy, but are almost invariably present in rapidly growing anaplastic tumors.

The prognosis after excision of the rectum for cancer steadily becomes worse with the increase in the number of metastases, especially when more than three or four glands are affected. The follow-up records show that patients with only from 1 to 3 lymphatic metastases often survive five years, but the fifth anniversary is rarely reached by patients with 4 or 5 metastases.

The conclusion the author has reached as a result of the survey of a large series of operative specimens of rectal cancer is that of the cases now being treated by a combined excision at least half (80 per cent of those without, and 20 per cent of those with, metastases) would have stood just as good a chance of cure if they had been treated by perineal excision. The combined operation is manifestly superior to the perineal for most cases with lymphatic metastases, but when only 1 or 2 of the regional glands are affected the disease may still be well within the scope of perineal excision. The champions of the combined operation may declare that by substituting the combined for the perineal operation they have given a better chance of cure to at least half of their patients. The defenders of the perineal operation may reply that the surgeon using the combined excision submits about half of his patients to an unnecessarily extensive operation.

With the figures available at the present time the fairest procedure is to limit any comparison of these two operations to cases with lymphatic metastases. In cases without lymphatic metastases the survival rate is practically the same, irrespective of the operation, but when comparison is made of survival rates of those with lymphatic metastases, we see that the combined operation has a steadily increasing advantage over the perineal, which reaches 13 per cent after five years. JOSEPH K. NARAT, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Truesdell, E. D.: The Frequency and Future of Gallstones Believed to be Quiescent or Symptomless. *Ann. Surg.*, 1944, 119: 232.

Acknowledging the obvious objections to routine exploration of the peritoneal cavity as part of an abdominal operation, the author stresses the fact that an investigation of the gall-bladder region is often more informative than the invasion of other quadrants. If possible, and if no contraindications exist, Truesdell recommends such an exploration. He supports this advice by the following statement: gallstones were found in 50 of 500 women examined through celiotomy incisions made for pelvic surgery. Therefore, he continued this method of investigation in order to establish the percentage of occurrence of gallstones in women, and to gather authentic information as to the so-called quiescent or symptomless gallstones.

In addition to gallstones, conditions about the gall bladder itself, such as adhesions, large and tense gall bladders, a thickened gall-bladder wall with more or less rigidity due to chronic inflammation, or stones floating about in a considerable amount of bile in the fundus or in the ampulla, were found.

These examinations were carried out in women only. Most of them had pregnancies and were at an age when biliary disease could be expected, but there was no evidence that their operative conditions had any share in causing gallstones.

Supplementary histories of some patients revealed:

1. There may have been symptoms so slight as to be considered negligible or accounted for by dietetic indiscretions.

2. There may have been one or more suggestive or typical attacks in the remote past neither voluntarily reported nor inquired into previously.

3. Some patients were having gall-bladder symptoms at the time of operation, which were erroneously attributed to, or obscured by, the surgical condition obviously present.

In consideration of the potentialities of inactive gallstones, the distinction of quiescent and symptomless gallstones seems appropriate, the terms being self-explanatory.

There is so little information pertaining to the two types mentioned, that any knowledge of their effects upon local conditions or general health is earnestly to be desired. The causes of these gallstones also require further study. Plain roentgenograms, cholecystograms, the history, and any other means of obtaining information on this subject are essential aids to diagnosis. The subsequent histories of the gallstone cases enumerated were so varied that the problem of operations for quiescent or symptomless gallstones involved the judicious appraisal of many angles of physical and psychological conditions. Therefore, no general recommendation was tenable.

Among the 50 cases reported, 16 of the patients had more or less digestive disturbances, some with fat-meal intolerance and 2 gave a history of typhoid fever. Forty of the 50 were found to have stones and were asked especially about typhoid fever; 4 said they had had this disease. Of the 500 patients questioned, 13 (5 per cent) had had typhoid fever. Twice as many patients who had had typhoid fever escaped gallstones as those who had had typhoid fever and developed them.

Very few of this group that had a small solitary round stone in the gall bladder escaped subsequent consequences of the retained stones. The author claims that there are very good and numerous reasons for the removal of the gall bladder which contains stones.

A summary of the 50 patients found at operation to have gallstones follows:

Six received immediate treatment.

Eight died more or less promptly.

Twelve sooner or later returned for removal of their gall bladder.

Twelve were lost to observation after various periods of time.

Twelve remained under observation at the time the article was written.

Only 2 cases from a fairly large group of mild biliary disease are presented as examples of symptomless gallstones.

Numerous cases of quiescent gallstones were discovered; they varied greatly in duration, judged by the period of time elapsing between the discovery of the stones and the last preceding attack, or a subsequent attack, or both.

A brief review of the 50 cases and their operative procedures is appended. The summary presents the important points of these cases and definitely supports the practice of cholecystectomy when stones are found in the gall bladder.

MATHIAS J. SEIFERT, M.D.

Bearse, C.: Gallstones: How Far May We Go in Postponing Operation? *J. Am. M. Ass.*, 1944, 124: 497.

The author reviews 253 consecutive cases of cholecystectomy. The patients were all white, and their ages ranged from fourteen to seventy-seven years. The average duration of symptoms was five and one-tenth years. One-hundred and fifty-three patients (61 per cent) had symptoms attributable only and directly to the cholelithiasis; the average duration of the symptoms was four and six-tenths years. The remaining 100 patients (39 per cent) had the following complications: acute cholecystitis including empyema, gangrene, and perforation of the gall bladder in 68 cases (27 per cent); common duct stones in 30 cases (12 per cent); acute pancreatitis in 10 cases (4 per cent). Six patients with acute pancreatitis had edema of the pancreas and 4 had acute hemorrhagic pancreatitis. The average duration of symptoms in the patients having acute pancreatitis was three and nine-tenths years. Of these, 5 had had symptoms for a period of less than one year.

Five patients had diabetes. All 5 were over forty years of age, and the average duration of symptoms was nine and six-tenths years. Removal of the gall bladder did not reduce the severity of the diabetes. Three patients had carcinoma of the gall bladder, biliary symptoms having been present for periods of six, twenty-seven, and forty years, respectively.

There were 16 deaths, only 3 of which could have been attributable to delay in surgical intervention. These 3 deaths occurred in the group with biliary complications.

The author's conclusions are as follows: "The presence of complications adds to the risk of operation and calls for prompt treatment. Early operation is likewise desirable for cholelithiasis without complications, since delay increases the likelihood of their occurrence. Operation, however, may be safely deferred in patients with gallstones so long as there is no evidence of complications and provided postponement is not so protracted that it may impair the patient's resistance to the operative procedure."

EARL O. LATIMER, M.D.

MISCELLANEOUS

Rea, C. E.: The Use of Sulfonamides in Abdominal Surgery. *Minnesota M.*, 1944, 27: 99.

This report gives the impressions of the author in evaluating the effects of sulfonamides in surgical wounds, with special interest in the prevention of peritonitis.

The literature is briefly reviewed. The author then establishes the fact that in clinical surgery the

evaluation of the sulfonamides must consider the following factors:

1. The experience of the operator. With further experience, the subsequent cases should receive better treatment. This significant point is rarely considered in clinical papers. Sulfonamides have been used in the last cases treated, and the better results reported could, in part, be attributed to the increased skill and experience of the surgeon, as well as to the drug. This is shown by the fact that in one-stage abdominoperineal resection for carcinoma of the rectum, the mortality is from 6 to 10 per cent in the hands of most experienced operators whether sulfonamides are used or not.

2. Alternate cases should be used. A comparison of cases treated in one period with those of another may lead to erroneous conclusions, as, for example, the evaluation in results of empyema, in which there is a seasonal variation in the virulence of the disease.

3. The time factor. If sulfonamides are used before gross infection is present, the results logically will be better than when they are used in the presence of gross suppuration.

Sulfonamides are not indicated in clean surgical cases. In infected wounds, the sulfonamides are not of much value unless débridement of the grossly infected tissue is done. Even after the débridement it is questionable whether the healing time is shortened as compared to that in the controls. There is still some doubt whether the introduction of sulfonamides impairs wound healing.

The literature contains many reports recommending the use of sulfonamides in the peritoneal cavity in cases in which there has been accidental or transitory contamination. These reports are not well controlled. The author believes that if sulfonamides are used after the peritonitis is well developed, the survival rate will not be markedly influenced, as has been shown in his experimental studies on rabbits. The sulfonamides were most effective in the preperitonitis stage. This was to be expected, for they adhere to a protein exudate, such as pus, and become inactivated. The author knows of no well controlled, large series of cases that shows sulfonamides to be of definite value in the treatment of generalized peritonitis of enteric origin.

SAMUEL J. FOGELSON, M.D.

GYNECOLOGY

MISCELLANEOUS

Hartman, C. G.: Recovery of Primate Eggs and Embryos. Methods and Data on the Time of Ovulation. *West. J. Surg.*, 1944, 52: 41.

The author describes methods of recovery of primate eggs and embryos and data on the time of ovulation.

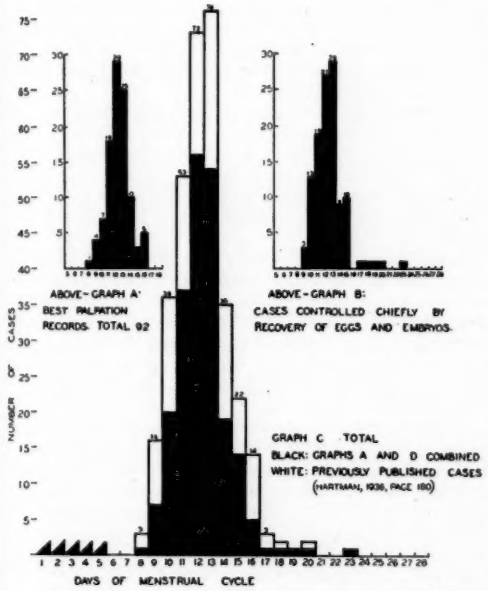
Graph 1 shows the distribution curves of the day of ovulation in the rhesus monkey, counting the first day of menstruation as the first day of the cycle. In all of the graphs, the twelfth and thirteenth days stand out as the days most favored for ovulation, one-half of the ovulations occurring on these days.

Graph 2 shows the distribution of the ovulation days of the rhesus monkey, and it is apparent that the tendency to repeat the ovulation days in different cycles is not very marked.

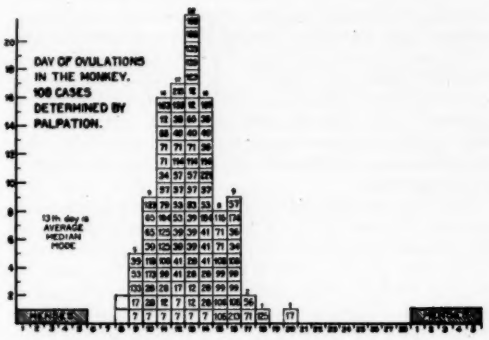
Graph 3 shows the distribution curves of the postovulatory interval in the rhesus monkey. In both curves A and B, as well as in the combined curve C, the fifteenth and sixteenth days are ovulation days in 42 per cent of the cases; the fourteenth to seventeenth days in 63 per cent; and the twelfth to eighteenth days in 92 per cent. By and large, the trend favors the Ogino-Knaus theory, but the exceptions are even more serious, if one wished to build up a schedule of fertile and safe periods for the monkey on this basis, rather than on the readier and more definite method of calculation from the beginning of the menstrual flow.

The exact data which will finally reveal how nearly the Ogino-Knaus theory represents the truth are still lacking for man. In the meantime this theory is probably relatively correct and the birth-control measure based upon it will continue to work fairly well in the hands of the intelligent and willing.

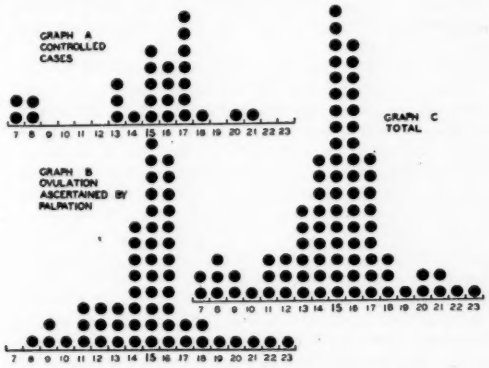
CHARLES BARON, M.D.


ABOVE - GRAPH A:
BEST PALPATION RECORDS. TOTAL 92
ABOVE - GRAPH B:
CASES CONTROLLED CHIEFLY BY RECOVERY OF EGGS AND EMBRYOS.
GRAPH C TOTAL
BLACK: GRAPHS A AND D COMBINED
WHITE: PREVIOUSLY PUBLISHED CASES (HARTMAN, 1936, PAGE 180)
NUMBER OF CASES
DAYS OF MENSTRUAL CYCLE

Graph 1. Distribution curves of day of ovulation in the rhesus monkey, counting the first day of menstruation, day 1. Graph A, day of ovulation checked by recovery of eggs or embryos; Graph B, day of ovulation determined by palpation; Graph C, black, A and B combined; white, 108 cases previously published.



Graph 2. Distribution of ovulation days of the rhesus monkey. The numbers in the squares relate to the animal in question (Hartman, 1936).



Graph 3. Distribution curves of postovulatory interva in the rhesus monkey. Graph A, cases checked in various ways in addition to palpation; Graph B, ovulation determined by palpation; Graph C, A and B combined.

Lyon, R. A.: Management of the Climacteric With Ethinyl Estradiol. *Am. J. Obst.*, 1944, 47: 532.

The climacteric syndrome, composed of hot flashes, vertigo, irritability, moods of depression, tendencies toward obesity and hypertension, premenstrual tension, headaches, and insomnia in varying degrees of severity, has been noted in most women by the age of fifty. The largest number of healthy climacteric women is but slightly affected; there are, however, such gradations in severity that a significant proportion of women are notably distressed by this pattern of symptoms.

Prior to the introduction of estrogen for the management of the severe climacteric syndrome, sedatives, tonics, thyroid, and psychotherapy were utilized. The success of these measures was limited, and during the past five years estrogen administration has become the treatment of choice for the severe case. Oral administration was initially achieved with a nonphysiological estrogenic preparation, diethylstilbestrol. Ethinylated estradiol has been found to be effective following oral administration. It has been determined that the required dose is quite small. The active portion apparently is slowly released from its ester and, therefore, a continued effect is maintained.

Unselected consecutive clinic patients who presented the symptoms and physical findings of the climacteric syndrome were investigated by means of basal body-temperature determinations, vaginal hydrogen-ion-concentration readings, and endometrial biopsies. When the patient continued to menstruate, the biopsy was taken during the fourth week of the cycle. Detailed subjective reports were recorded for one control cycle, following which the patients were given 50 μg. of ethinyl-estradiol tablets daily by mouth for courses of twenty-one days. Then there was an interval free from treatment, usually one week, to permit the regression of the endometrium and to allow the estrin-sensitive tissues to be restored to their optimal effectiveness.

Half of the women found the seven-day interval too long since before it had been completed there was a recurrence of the hot flashes. Occasionally, one of these who failed to carry through this seven-day interval without estrogen, was given additional tablets in such a manner that the therapeutic plan provided twenty-four days of treatment, and was followed by a four-day interval without treatment. Forty-five women (with an average age of forty-six) who complained of climacteric symptoms for an average of three years were studied prior to treatment for a control cycle, and then through estrogen-treated cycles varying from three to twenty-four per patient. Three hundred and forty-eight treatment cycles compose the basis for this study.

In 17 per cent of the 55 per cent of the patients who continued to menstruate, there was some degree of progestational change in the endometrium during the last half of the control cycles. The remaining endometrial biopsies showed healthy endometrium with varying degrees of proliferation. The patients had an additional biopsy on completion of six months of treatment. None of these showed hyperplasia of the endometrium which developed during the period of investigation.

Nine per cent had headaches persist after treatment. Nearly 7 per cent were nervous and restless after treatment although the flashes were well controlled. Approximately 2 per cent of the patients continued to have flashes, although these were decreased in severity and frequency. Attempts to decrease the dosage of ethinyl estradiol resulted in the reappearance of flashes in most of the patients who had been controlled with 50 μg. In patients who were accustomed to the occasional use of alcohol it was found that flashes ordinarily appeared the day following its use even though they had taken their customary dose of estrogen. However, doubling of the dose on these occasions tended to restrict the flashes completely.

The average duration of treatment prior to control of the flashes was three and eight-tenths days, while in subsequent cycles the average was decreased to three days. Upon completion of a twenty-one-day course of estrogen tablets, it was noted that an average of five and one-half days (a range from one to twelve days) passed before the patient reported recurrence of the flashes.

The hydrogen-ion concentration of the midvagina prior to therapy averaged 5.3. Following three weeks of continuous treatment with ethinyl estradiol, the average reading decreased to 4.9. However, many patients showed negligible change in *p*H even when the flashes were prevented as a result of the estrogen treatment.

Ethinyl estradiol in the small dose used in this study does not ordinarily cause withdrawal bleeding in women past the menopause. In the menstruating group, which included more than half of this series, bleeding during the treatment phase or during the week free from treatment, was not excessive. There were no instances of well defined menorrhagia or metrorrhagia.

Control of the distressing vasomotor and emotional symptoms of the climacteric has been obtained with this orally active and relatively well tolerated estrogen. Minimal doses have been effective and side reactions few, none of them being of severe degree. Probably the paucity of extraneous reactions is a result of the small dose employed, for when it was increased appreciably the number and incidence of reactions was greater. J. ROBERT WILLSON, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Kaminester, S.: Experience With the Six-Hour Rat Test for Pregnancy. *Am. J. Obst.*, 1944, 47: 265.

Female rats are used as the test animals. They must be about four weeks old and weigh about 30 gm.

Two animals are employed and 2 cc. of urine are injected subcutaneously into each. After six hours, the animals are asphyxiated with illuminating gas.

TABLE I.—RESULTS IN PREGNANT WOMEN

	Rat test			Friedman test		
	Total	Positive	Negative	Total	Positive	Negative
1st trimester	39	37	2 (a, b)	20	18	2 (b, c)
2nd trimester	2	2				
3rd trimester	13	13				
Duration unknown	9	9				
Total	62	61	1	19	18	1

(eliminating dead fetus case)

a—Test in rat negative but Friedman test positive. Clinically the patient was shown to be pregnant.

b—Both rat and Friedman test were negative. In this case the fetus had been dead for about 3 months.

c—Friedman test negative but rat test positive. This patient was shown to be pregnant clinically.

In positive cases, the ovarian hyperemia is manifested by a reddening of the ovary. This redness is grossly visible in good light. Usually the uterus, too, is edematous and red-looking, although the interpretation of the test depends on the ovarian and not the uterine conditions.

TABLE II.—RESULTS IN NONPREGNANT WOMEN AND IN MALES

	Rat test			Friedman test		
	Total	Positive	Negative	Total	Positive	Negative
Males	15	0	15	0	0	0
Nonpregnant Women	29	1 (d)	28	9	0	9
Totals	44	1	43	9	0	9

d—As this was one of the early cases, the error may have been due to inexperience in interpreting the findings.

In the negative cases, the ovaries are small and white and the uterus is a white threadlike structure.

In 107 cases, the results shown in the accompanying tables were obtained.

EDWARD L. CORNELL, M.D.

Dieckmann, W. J., Adair, F. L., Michel, H., Kramer, S., Dunkle, F., Arthur, B., Costin, M., Campbell, A., Wensley, A. C., and Lorang, E.: Calcium, Phosphorus, Iron, and Nitrogen Balances in Pregnant Women. *Am. J. Obst.*, 1944, 47: 357.

A group of patients were followed up through pregnancy and the puerperium to determine if the addition of calcium, phosphorus, iron, or vitamins A and D to their diet had any effect on the course of pregnancy, whether it prevented the development of complications, or whether it insured a higher incidence of normal infants. Studies of the serum calcium, phosphorus, and protein, as well as of the hematocrit and hemoglobin, showed them to be within normal limits and uninfluenced by the aforementioned additions to the diet.

A study of the effects of the addition to the diet on the various complications of pregnancy showed some differences, but no definite conclusions could be drawn. The duration of labor was certainly not shortened by the administration of vitamin D, as has been suggested. The addition to the diet caused a significant increase in maternal weight, but no significant effects were noted on the fetus that could be attributed to it. Unquestionably, a proper diet predisposes to better health, to a normal pregnancy, and to a healthy child, but the value of the diet can be proved only by prolonged studies of a large number of pregnant women in an institution.

EDWARD L. CORNELL, M.D.

Sage, E. C.: The Care of the Parturient Woman in Relation to Neonatal Mortality. *J. Am. M. Ass.*, 1944, 124: 339.

Deaths during the first month of life approximate 70,000 annually. In 1941 fetal and neonatal deaths aggregated 44,692, 10.4 per cent of the total deaths for all ages and all causes. Since 1937 the infant and neonatal death rates have been declining, although the actual number of stillbirths and neonatal deaths have increased because of the increase in births.

The major causes of neonatal mortality are prematurity, birth injury, anoxemia, asphyxia, infection, and exposure to unfavorable conditions of external environment immediately after birth. It has been stated that neonatal mortality may be reduced more than a third.

ASPHYXIA

According to several observers, asphyxia is the most important and frequent cause of neonatal death. The neonatal death rate has remained surprisingly constant for many years, while pediatricians have reduced infant mortality at a rapid rate. When advances are made in the prevention and management of fetal asphyxia the result will be a significant drop in fetal and neonatal mortality and morbidity. Careful study of the complications of pregnancy

which are potential causes of fetal asphyxia may result in methods of obstetric management beneficial equally to mother and child.

The prevention of fetal asphyxia demands obstetric anesthesia and analgesia that do not produce fetal anoxemia or injure the fetal respiratory center. With caudal anesthesia, primary respiration in the infant is established promptly, and maternal anesthesia is satisfactory without the production of harmful fetal asphyxia. However, for the present, at least, the use of the method should be confined to institutional practice by persons trained and experienced in caudal anesthesia.

A few fundamental principles in the therapy of neonatal asphyxia are:

1. Gentleness. It should be exercised in direct relation to the severity of the asphyxia.
2. A patent respiratory tract. Oxygen must reach the alveoli of the infant's lungs.
3. Body heat must be maintained and in the premature infant this becomes vital.
4. There is no rationality in any violent forms of resuscitation, including Schulte swinging, dilation of the anal sphincter, hot and cold tubbing, and dousing with ether.

PREMATURITY

Prematurity takes precedence over almost any other primary or contributing cause of infant death. Mortality rates are much higher for premature infants than for infants born at term, and the mortality rate of premature infants increases decidedly in the group with a low birth weight. If the mortality is calculated in relation to the weight at birth, the increased likelihood of survival with increasing weight is clearly shown. The birth weight of the premature infant is the single factor, almost without exception, that determines the survival of the infant, whether delivered spontaneously, by low forceps, or by cesarean section.

The treatment of the premature infant presents four major problems: (1) the maintenance of body temperature, (2) proper nutrition, (3) prevention of cyanotic attacks, and (4) prevention of infection.

BIRTH TRAUMA

The intracranial cavity is the most common site of fatal traumatic lesions in the fetus. Distortion of the shape of the fetal head as it passes through the birth canal may cause a laceration of the vein of Galen or the membranes which support the brain; hemorrhage results and death is usually due to the effect of increased cranial pressure on the respiratory center. Vitamin K administered intravenously to the mother before delivery effectively prevents prothrombin deficiency in the newborn infant and probably serves to check a slowly oozing hemorrhage. This therapy is particularly valuable when the infant is likely to be premature, also when labor is prolonged or if operative delivery of any type is anticipated.

Interference with the transfer of oxygen through the umbilical cord from any cause will result in injury to the fetal tissues and, if sufficiently severe and prolonged, will cause death. Abnormal prolongation of the second stage by pressure on the perineum during general anesthesia may produce a serious degree of fetal asphyxia. Conversely, if the cervix is fully dilated, shortening of the second stage of labor by low forceps delivery and episiotomy may reduce asphyxia.

Different methods of delivery show definite variations in the incidence of intracranial hemorrhage. When the total death rate for each type of delivery and the incidence of intracranial hemorrhage are both taken into account, it is found that the highest death rate is associated with version and extraction. The next highest is associated with midforceps and high forceps delivery, and then with breech delivery. The incidence is considerably lower in the remaining types of delivery. In breech deliveries more bad results have followed the attempt to deliver through an undilated os than from any other single cause. The practice of pulling with forceps against a resistant cervix is to be condemned.

MATERNAL COMPLICATIONS AFFECTING NEONATAL MORTALITY

There is a high incidence of prematurity, stillbirth, and neonatal death associated with parturient women with hypertension, albuminuria, or edema during pregnancy. In a series of 52 toxemic patients 9 fetal deaths were encountered, nearly all stillbirths, and the fetal mortality was therefore 17 per cent. The survival among babies born to women suffering from severe toxemia is less than survival in normal cases; this is true especially of premature babies. Continuation of pregnancy to term, however, may not be desirable, as the fetus may die in the uterus.

Abruptio placenta is one of the gravest accidents with which the obstetrician has to deal and accounts for many fetal deaths. When the placenta is completely detached the maternal mortality is from 5 to 10 per cent, and from 95 to 100 per cent of the infants are lost. In a partial detachment of the placenta when the fetus is viable and proper equipment and personnel are available, a timely cesarean section may be done in the interests of the child.

In the management of pregnancy complicated by heart disease, tuberculosis, diabetes, some of the anemias, hyperthyroidism, chronic infection of the urinary tract, and antepartum hemorrhage, induction of premature labor may prove to be the most rational and effective treatment.

J. Robert Willson, M.D.

Weinstein, B. B., Wohl, Z., Mitchell, G. J., and Sustendal, G. F.: Oral Administration of Pyridoxine Hydrochloride in the Treatment of Nausea and Vomiting of Pregnancy. *Am. J. Obst.*, 1944, 47: 389.

Complete or considerable relief from nausea and vomiting of pregnancy was obtained in 68 patients who were treated with orally administered pyridoxine hydrochloride (B_6) in dosages of from 10 to

20 mgm., given three to four times daily, to make up total dosages of from 210 to 2,500 mgm. Similar results were obtained in a group of 10 patients who received a combination of intramuscular and oral pyridoxine-hydrochloride therapy.

Eight patients obtained complete relief without recourse to supplementary therapy and 2 patients required additional therapy. Of 37 patients with nausea confined to the morning, 34 were completely relieved and 3 were partially relieved. Of the 18 patients with nausea extending throughout the day, 17 were completely relieved and 1 was partially relieved. Of the 13 patients with nausea and occasional vomiting, 11 were completely relieved and 2 were relieved of vomiting but complained of occasional nausea.

Ten patients with nausea and vomiting so severe as to prevent the retention of food were observed. Of these, 8 obtained complete relief with the combined use of orally and intramuscularly administered pyridoxine hydrochloride, and 2 required additional therapy. This group showed the most noteworthy and impressive response; however, they required closer supervision and greater individualization of therapy than the patients of the other groups. No toxic manifestations were noted.

The use of pyridoxine hydrochloride has proved of value in this group of 78 patients; however, the value of sedation and adequate dietary supervision should continue to command attention and should be utilized with pyridoxine hydrochloride as an important adjunct in the therapy of nausea and vomiting of pregnancy. EDWARD L. CORNELL, M.D.

Falkiner, N. M., and Apthorp, J. O. E.: The Placenta in Eclampsia and Nephritic Toxemia. *J. Obst. Gyn. Brit. Empire*, 1944, 51: 30.

Eclampsia is associated with a typical placental lesion of an acute form characterized by engorgement of the fetal circulation and a gradual disappearance of the intervillous space, which means the disappearance of the maternal circulation and corresponding necrosis in the villous tree.

One of the lesions in the placenta associated with nephritic toxemia is a less acute condition of the same type. The reason for this is that the individual lesion may develop more slowly or that the placenta gradually becomes involved, cotyledon by cotyledon, whereas in eclampsia the whole placenta becomes involved suddenly. A second type of lesion is seen in nephritic toxemia which is apparently directly due to partial placental separation with consequent degenerative change in the involved cotyledon.

The early stages in the lesion associated with eclampsia will still permit maintenance of function in so far as oxygenation of the fetus is concerned.

The question of imparting an etiological importance to these acute lesions of the placenta should be approached with caution. Young's recent work on accidental hemorrhage seems to bring the probability of the existence of placental toxins nearer to certainty.

The authors allude only to one possible result of placental damage associated with the eclamptic lesion. In studying sections they have at times been doubtful as to whether fetal blood has been extravasated into the intervillous space. Should this be the case there may be forthcoming an explanation for the occurrence of eclampsia which would be comparable to the recent explanation of the occurrence of erythroblastosis foetalis. CHARLES BARON, M.D.

LABOR AND ITS COMPLICATIONS

Radcliffe, W.: The Blood Pressure in Midwifery. *Brit. M. J.*, 1944, 1: 354.

Since the barbiturate drugs produce such marked hypotension, they should be used only in the early stages of labor, and are best avoided within a short time of delivery. Any hypotension which may be present during the third stage of labor is to be regarded as a danger sign, and the blood pressure should be restored before anything else is done. The only exception to this rule is the minimum steps necessary to stop hemorrhage.

It is not always appreciated that in cases of traumatic shock the precipitating injury precedes the secondary factors, such as pain, exhaustion, drug depression, and injudicious rough handling, which join in to complete the clinical picture; whereas in labor most of these factors will have been present for some hours before the final trauma which determines and initiates shock. The ultimate state of shock is the same, but the sequence is different. When a long and difficult labor is anticipated there is a particularly favorable opportunity of controlling these factors, especially if the blood pressure is studied.

The general practitioner is urged to use his sphygmomanometer at the bedside in his midwifery. CHARLES BARON, M.D.

Ekas, W. L.: Sixteen Years' Experience with Placenta Previa Emphasizing Conservative Therapy. *N. York State J. M.*, 1944, 44: 385.

Placenta previa is a most serious complication of pregnancy. The first bleeding occurs early in pregnancy in about 10 per cent of the cases. Painless bleeding late in pregnancy demands investigation. The best method of making the diagnosis is by vaginal examination and palpation of the placenta. Before examination, however, blood for transfusion and facilities for the control of hemorrhage should be available. The prognosis depends upon the amount of bleeding, the type of placenta previa, the available facilities, the type of treatment, and the skill of the obstetrician. Treatment should be directed toward the control of bleeding, safe delivery, and the prevention of infection.

The author reports 86 cases of placenta previa only 4 of which were delivered by cesarean section. Bleeding was controlled or labor was induced in 66 (76.6 per cent) by the insertion of a Voorhees bag. After complete dilatation delivery was accomplished by version and extraction 31 times, by breech ex-

traction 12 times, and by low forceps delivery 4 times, it occurred spontaneously 35 times. The incidence of operative delivery was 58.2 per cent.

Watchful expectancy has no place in the treatment of placenta previa; treatment should be started as soon as the diagnosis is made. Vaginal tamponade is rarely indicated and increases the hazard of infection. Accouchement force has no place in the treatment since the cervix is easily torn and it increases both hemorrhage and infection.

J. ROBERT WILLSON, M.D.

Skinner, A.: A Five-Year Survey of Cesarean Sections in Ramsey County, Minnesota. *Minnesota M.*, 1944, 27: 124.

The report presents a statistical analysis of the cesarean sections which have been performed in 10 hospitals in Ramsey County, Minnesota during the five years from 1938 to 1942, inclusive, and compares these figures with twelve other surveys that have been reported from other parts of the United States.

The total hospital deliveries for that five-year period was 28,868, with a maternal mortality of 0.12 per cent and a stillbirth rate of 2.4 per cent. Four hundred and thirty-four of the deliveries were accomplished by cesarean section, an incidence of 1.5 per cent. The type of operation was reported as classical in 40 per cent, low cervical in 30 per cent and extraperitoneal in 1 percent; the Porro operation was done in 6 per cent and in 23 per cent the type of operation was not given. General anesthesia was used in 87 per cent, local in 2 per cent, local and general in 9 per cent, and spinal in 2 per cent.

The maternal mortality among the 434 cesarean sections was only 1.84 per cent. That together with the low incidence of only 1.5 per cent is very commendable.

The indications for the cesarean sections, in decreasing order, were disproportion, placenta previa, toxemia, premature separation of the placenta, and previous cesarean section.

The fetal mortality of 11.2 per cent is quite high; in fact, it is higher than in any of the nine (3 are not given in the table) other reports used for comparison, but as stated, many of the other reports did not define their figures well, whereas the figures of 11.2 per cent in this report is uncorrected and includes neonatal deaths as well as stillbirths. The author did not give the fetal mortality for various periods of gestation, and the size of the babies, nor did he state whether toxemia was present or absent, and what other factors entered into the fetal mortality. General anesthesia was used in 96 per cent of the cases and may have been a factor in this high fetal mortality.

C. E. GALLOWAY, M.D.

NEWBORN

Parsons, L. G.: Prevention of Neonatal Disease and Death. *Lancet*, Lond., 1944, 246: 267.

Fetal and neonatal mortality are responsible in England and Wales for 43,000 lives annually as compared with 28,000 for tuberculosis and 56,000 for cancer. In 1905 the mortality rate for one month was 41 per 1,000 live births; the most recent rate was 28 per 1,000.

The four major causes of neonatal death are asphyxia, birth injury, prematurity, and infection.

Asphyxia is said to play a part in at least one-half the neonatal deaths. The fetus in utero is always in a state of relative anoxemia which may be increased by four conditions: (1) anoxic anoxemia due to anything which disturbs the mother's respiration or circulation, (2) anemic anoxemia due to maternal anemia, (3) stagnant anoxemia due to compression of the cord, and (4) histotoxic anoxemia due to the lowering of the activity of the respiratory center or tissues by drugs, anesthetics, or disease. The factors acting in the neonatal period are those which prevent normal respiratory activity, as obstruction, congenital defects and prematurity.

The adherent alveoli in the lungs are expanded by the first deep breaths. In an asphyxiated baby this does not occur but may be aided by the administration of a mixture of oxygen and nitrogen; oxygen alone is rapidly absorbed and allows the alveoli to collapse again.

Birth injury is often a result of prematurity. The most common fatal injuries are those involving the brain. The author believes that most severe intracranial injuries prove fatal and that neurological conditions usually attributed to hemorrhage are more likely to be on the basis of asphyxia.

Prematurity presents a twofold problem; prevention of the condition and care of the premature infant. The most important factor in lowering the mortality rate for prematurity is a better understanding of the physiology and the requirements of the premature child and improved nursing and feeding techniques.

Infection in the newborn may be unrecognized by other than skilled experienced pediatricians. Infections in the newborn are more apt to be generalized and fatal than those in older children. The common sites of entry of infections are the skin and mucous membrane, the umbilicus, the alimentary tract, and the respiratory tract. These may be kept at a minimum by improving the nursery technique, by elimination of all visitors and infected attendants, and by care in preparation of formulas and in feeding.

J. ROBERT WILLSON, M.D.

Taylor, G. L., and Race, R. R.: Hemolytic Disease of the Newborn. *Brit. M. J.*, 1944, 1: 288.

There is a marked preponderance of homozygous fathers in families affected by hemolytic disease of the newborn; the homozygote appears to be about four or five times more dangerous than the heterozygote. This predominance of homozygotes affects enormously the chances of birth of Rh-negative, and therefore unaffected, children. The genotype of about three-quarters of Rh-positive people can be determined serologically, and unless it can be shown that the father is heterozygous in this way, or by his

having an Rh-negative child or an Rh-negative parent, the prognosis is entirely unfavorable.

CHARLES BARON, M.D.

Boorman, K. E., Dodd, B. E., and Mollison, P. L.: The Incidence of Hemolytic Disease of the Fetus ("Erythroblastosis Fetalis") in Different Families. The Value of Serological Tests in Diagnosis and Prognosis. *J. Obst. Gyn. Brit. Empire*, 1944, 51: 1.

One hundred families were given tests because of the birth of a fetus suspected of being affected with hemolytic disease. In every case the mother was tested and in the majority of cases the infant or the father was also examined. In 70 cases tests were made on women who had given birth to one or more stillborn fetuses; and in a further 60 cases in which the infant was thought to be affected with "physiological jaundice," the mother and infant were tested. A group of normal mothers and infants was also tested to obtain control material.

The ABO group of the erythrocytes was determined by a tube method and the Rh group was determined by a technique described previously (Boorman, Dodd, and Mollison), done with 3 different human immune anti-Rh sera. No attempt was made to differentiate between subgroups of Rh. The Rh-positive bloods included one blood which was known to give consistently strong reactions with many different human anti-Rh sera; the other Rh-positive blood used gave weaker reactions with most anti-Rh sera but with occasional sera gave even better reactions than the first blood.

In cases in which anti-Rh agglutinins were not found in the mother's serum, the serum was tested against 20 different group O bloods taken at random, to discover if atypical agglutinins were present.

Immune agglutinins which were incompatible with the fetal erythrocytes were found in 96 of the 100 cases. In 93 cases the agglutinin was anti-Rh; in 1 other case, the agglutinin was identified as anti-Rh, and in the remaining 2 cases it was anti-B.

Seventy mothers who had had one or more miscarriages or stillbirths were tested. In 11 cases anti-Rh agglutinins were found in the serum; the death of the fetus in these 11 cases is considered to have been due to hemolytic disease. In 3 other cases, very potent anti-A or anti-B agglutinins were found.

The failure to find immune agglutinins in the remaining 56 cases renders it unlikely that in more than a few of these instances was the fetus affected with hemolytic disease.

Six of the 60 mothers were Rh-negative. In 3 of these cases, anti-Rh agglutinins were found in the mother's serum. One of these 3 cases occurred in a family described in which a previous infant had been affected with "icterus gravis". The present infant may also have been affected. In the 2 other cases the infant developed only the mildest degree of jaundice, and repeated examination of blood films never revealed any abnormality, so that the diagnosis of hemolytic disease appeared to be definitely excluded.

In the majority of cases of "physiological jaundice" no incompatibility between the mother's serum and the infant's erythrocytes could be detected.

The significance of serological tests in suspected cases of hemolytic disease may be summarized as follows:

A. Diagnosis very probable

1. When the mother is Rh-negative and her fetus is Rh-positive, and when anti-Rh agglutinins are found in the mother's serum.

2. When the mother is Rh-positive and her serum contains any other atypical agglutinins, related or unrelated to anti-Rh, incompatible with the fetal erythrocytes and active at 37°C.

B. Diagnosis less probable

1. When the mother's serum contains exceptionally potent anti-A or anti-B agglutinins incompatible with the fetal erythrocytes.

2. When the mother is Rh-negative and the fetus Rh-positive but the mother's serum does not contain any anti-Rh agglutinins.

C. Diagnosis improbable

1. When mother is Rh-positive and her serum is compatible with the infant's erythrocytes, or the incompatibility is due merely to anti-A and anti-B agglutinins of ordinary potency.

Knowledge of the relationship between sensitization of the mother to the Rh agglutinogen and affection of the fetus with hemolytic disease may lead to the performance of Rh tests upon mothers during pregnancy as a routine. Although it is clear that the outlook for Rh-negative mothers as a group is less favorable than that for Rh-positive mothers, the finding that a given mother is Rh-negative is not in the individual case of very great significance. If it is true that approximately 1 in 400 fetuses is affected with hemolytic disease (Javert), and if, for the moment, it is assumed that these are only born to Rh-negative mothers, the chances that any given fetus of an Rh-negative mother taken at random will be affected are only approximately 1 in 60. When anti-Rh agglutinins are found the outlook will usually be bad.

Changes in titer of anti-Rh agglutinins during pregnancy are not in the present state of knowledge very informative.

The main importance of making Rh grouping tests during pregnancy as a routine is the detection of Rh-negative women so as to ensure that if they require a blood transfusion they shall not receive Rh-positive blood. The transfusion of Rh-positive blood to any Rh-negative woman of childbearing age may have one of two unfortunate consequences. If the woman has already been sensitized to the Rh agglutinogen she may suffer a severe hemolytic reaction. Alternatively, if she has not yet been sensitized to the Rh agglutinogen, she may become sensitized by the transfusion, so that in a subsequent pregnancy she becomes more likely to affect her fetus.

In families in which hemolytic disease of the fetus occurs, although a mother may have 2 or even more normal children first, once she has started having

affected children, all subsequent children will be affected. When the mode of inheritance of the Rh factor was investigated, however, it became clear that an Rh-negative (rhrh) woman with an Rh-positive husband would have all Rh-positive children if the husband was homozygous (RhRh), but that if he were heterozygous (Rhrh) there would be an even chance that any given child would be Rh-negative. In such families it would be expected that once the mother had become sensitized to the Rh agglutinogen the infants would be affected or unaffected according to whether they were Rh-positive or Rh-negative.

DANIEL G. MORTON, M.D.

MISCELLANEOUS

Rock, J., and Hertig, A. T.: Information Regarding the Time of Human Ovulation Derived From a Study of 3 Unfertilized and 11 Fertilized Ova. *Am. J. Obst.*, 1944, 47: 343.

Data relating to 14 human ova (3 unfertilized and 11 fertilized) have been considered with a view to discover the time of ovulation. In the cases with the 3 unfertilized eggs, the lengths of the preovulatory and postovulatory phases have been calculated, the histology of the endometrium and of the ripe follicle or early corpus luteum being utilized in conjunction with the menstrual history, and, to some extent, the cytology of the ovum itself.

By means of these data, it was found in the 2 cases with tubal eggs, that while the preovulatory phases varied from one to three days (ninth to tenth, and eleventh to twelfth days of the cycle, respectively), the corresponding computed postovulatory phases were identical: from fifteen to fourteen days. In the case of a ripe follicular egg, ovulation was estimated as being due between the eleventh and twelfth days of the cycle; the postovulatory phase would then have been somewhat more than from fourteen to thirteen days long.

In the 11 cases of fertilized ova, the lengths of the pre- and postovulatory phases were likewise calculated; here, in addition to the histology of the endometrium and the related catamenial data, the mean estimated age of the embryo was utilized. In 8 of the 11 cases (72.7 per cent), the estimated postovulatory phase fell within the limits of from 16 to 12 (14 ± 2) days. In 2 of the 3 exceptions, the variation from the outermost limits of the theoretical range was one-half day, while in the third exception, the deviation was one day. When ovulation in these 11 cases was expressed as occurring in a certain percentile of the respective menstrual cycle with reference to the next expected period, the average postovulatory phase was found to occupy 47.2 per cent of the cycle.

Upon substituting for the experimentally derived estimated length of the postovulatory phase, the theoretical figure 12 in each case, the average value for these 14 postovulatory days was 45.2 per cent of the cycle. The correlation of these two values, 47.2 per cent and 45.2 per cent, expresses the proximity of the probable ovulation time in these cases to the fourteenth day before menstruation. These averages differ by only 2 per cent of the cycle length, which in these 11 cases averaged thirty and two tenths days. This difference is only six-tenths of a day, which is much less than the commonly accepted deviation of $\pm$ two days, from the theoretical mean length of the postovulatory phase of fourteen days.

The data from 3 unfertilized ova, as well as from a series of 11 fertilized ova, indicate that ovulation takes place about fourteen days before the first day of the next expected period.

EDWARD L. CORNELL, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Chamberlin, G. W., and Payne, F. L.: Urinary-Tract Changes with Benign Pelvic Tumors. *Radiology*, 1944, 42: 117.

The authors summarize the literature on the subject of changes in the urinary tract, and analyze their findings in 96 adult women who, at operation, were found to have benign pelvic tumors. There were no clinical signs or symptoms of significant urinary-tract disease in any of the patients. Intravenous urograms were made preoperatively, and from eight to sixteen weeks postoperatively. Of the 96 cases, 66 (68.7 per cent) showed roentgen evidence of ureteral obstruction, displacement, or both. Obstruction was present in 46 (47.9 per cent), displacement in 12 (12.5 per cent), and both obstruction and displacement were present in 8 (8.7 per cent) patients. Myomas of the uterus were encountered in 77 patients; 14 patients had ovarian cysts, and 5 had both a myoma and a cyst. Abnormal urographic changes were found in 56 patients (72.5 per cent) with myomas, 6 (43 per cent) with ovarian cysts, and 4 (80 per cent) with both cysts and myoma. Fifty of the tumors were approximately 10 cm. in diameter, and 2 measured 30 cm. No significant difference in the degree of dilatation was found in tumors greater than 10 cm. in diameter. The authors have concluded that the position of the tumor is more significant than its size, since the impacted or the intraligamentous tumors produced the greatest alteration in the urinary tract. In this series, the findings did not substantiate the observations of Kretschmer and Kanter, which showed that the cystic tumors produced a higher incidence of alteration of the urinary tract than did the solid tumors.

The changes seen in the urograms were qualitatively similar to those seen in pregnancy, but were rarely so pronounced. Dilatation of the ureter, when present, was seen always at the level of the pelvic inlet or slightly above. The dilatation was usually bilateral, often most marked on the right side. In the more pronounced cases of obstruction the ureters were widened, elongated, and redundant above the point of obstruction, and the renal pelvis and calices showed evidence of back pressure. Only 1 case of severe hydroureter and hydronephrosis was encountered. In no case was absence of function of 1 kidney seen. Displacement of the pelvic portion of the ureter was most often lateral; only in a few cases was the pelvic ureter straightened in a vertical direction by the mass.

Comparison of preoperative and postoperative intravenous urograms demonstrated, in all cases in which there was an abnormality, a return of the urinary tract to normal. One striking feature of the postoperative urograms was their poor diagnostic quality for morphological changes, compared to preoperative films. Without the pelvic mass the transportation of the dye was rapid, and filling of the renal pelves and calices was often incomplete.

In this series the urographic studies did not give a lead as to the type of pelvic tumor. Several cases of early malignant change in myomas, or in ovarian cysts were observed. While these cases were excluded from the series reported, a survey of the urograms revealed nothing distinctive. The authors state that extensive malignant growths, particularly of cervical origin, frequently influence ureteral function, and absence of function of one kidney in association with a pelvic tumor is indicative of extensive malignant growth. When only simple displacement or partial obstruction of the ureter is encountered, it is likely to be the result of a benign pelvic tumor, although it does not refute the presence of an early malignant neoplasm. DONALD F. MCDONALD, M.D.

McDonald, J. R., and Priestley, J. T.: Carcinoma of the Renal Pelvis. Histopathological Study of 75 Cases with Special Reference to the Prognosis. *J. Urol.*, Balt., 1944, 51: 245.

On the basis of study of 75 cases the following classification of carcinoma of the renal pelvis is proposed: (1) papillary, (2) papillary with infiltration, and (3) infiltrative. The distribution among the three groups was nearly equal. Five years after operation 52 per cent of the patients who had papillary carcinoma without infiltration were alive; whereas the corresponding percentages were 17 for those who had papillary carcinoma with infiltration, and 7 for those who had infiltrative carcinoma.

In 45 per cent of the cases the main renal vein, its principal tributaries, the perineural lymphatics, or a combination of these were involved. Only 4 per cent of the patients who had vascular involvement were living five years after operation, as opposed to 47 per cent of those who did not have vascular involvement.

Of the patients who had carcinomas of grade 1 or 2 (Broders' method), 63 per cent were living five years after operation; for those who had carcinomas of grade 3 or 4 the corresponding percentage was 13.

BLADDER, URETHRA, AND PENIS

Jewett, H. J.: Infiltrating Carcinoma of the Bladder: A New Ureterointestinal Anastomosis Employed in 29 Cases; Indications for Total Cystectomy. *Brit. J. Urol.*, 1943, 15: 121.

The author reviews the operative methods of ureterointestinal implantation. The basic principle of the Ferguson operation was considered to approach more nearly the ideal requirements of such a procedure, and the author describes an electrode for creating the ureterosigmoidal ostium. In the first stage of the operation the ureter is embedded in the bowel without angulation, torsion, tension, compres-

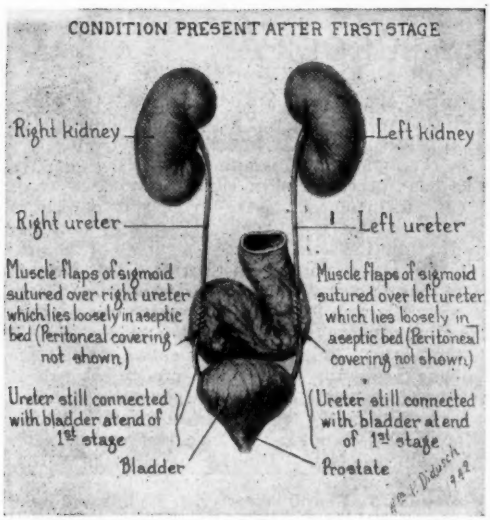

CONDITION PRESENT AFTER FIRST STAGE
Right kidney
Left kidney
Right ureter
Left ureter
Muscle flaps of sigmoid sutured over right ureter which lies loosely in aseptic bed (Peritoneal covering not shown)
Muscle flaps of sigmoid sutured over left ureter which lies loosely in aseptic bed (Peritoneal covering not shown)
Ureter still connected with bladder at end of 1st stage
Ureter still connected with bladder at end of 1st stage
Bladder
Prostate

Fig. 1. Condition present after first-stage operation of ureterointestinal implantation. Both ureters lie freely upon submucosa for a distance of 5 cm. without tension, torsion, angulation, or constriction. There is no communication between ureteral and intestinal lumens, and urine flows freely into bladder. Fixation of sigmoid to retroperitoneal flap on each side is not shown.

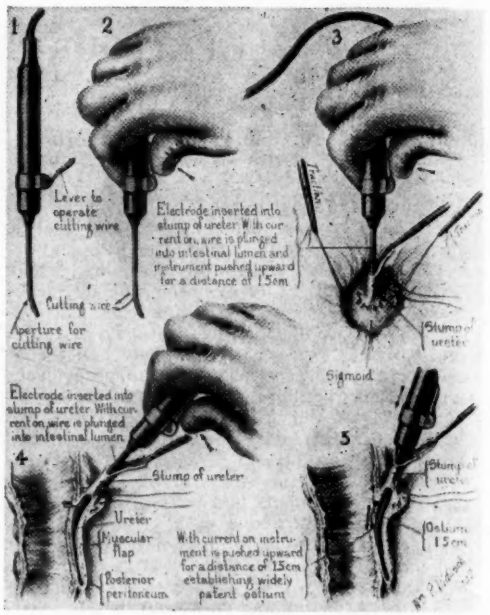

1
2
3
Lever to operate cutting wire
Electrode inserted into stump of ureter. With current on, wire is plunged into intestinal lumen and instrument pushed upward for a distance of 1.5cm
Cutting wire
Aperture for cutting wire
Stump of ureter
Sigmoid
Electrode inserted into stump of ureter. With current on wire is plunged into intestinal lumen
4
5
Stump of ureter
Ureter
Muscular flap
Posterior peritoneum
With current on instrument is pushed upward for a distance of 1.5cm establishing widely patent ostium

Fig. 2. Second-stage operation for ureterointestinal implantation. 1. Latest development of instrument for construction of ureterointestinal ostium. 2. Cutting wire emerges from opening when lever is depressed. 3. Insertion of instrument into stump of ureter. Beak of instrument is directly opposite ureterointestinal septum. Current is turned on and lever depressed. The cutting wire is plunged into intestinal lumen. With cutting current on, the instrument is pushed upward for a distance of 1.5 cm. against countertraction on sutures. 4. Sectional view showing wire in intestinal lumen after septum is pierced. Note insulated beak protects opposite wall of ureter and overlying wall of bowel. 5. Instrument pushed upward for a distance of 1.5 cm. to establish a widely patent ostium.

sion, or the production of a periureteral scar so that ureteral peristalsis is not impaired. The second stage consists in establishing an adequate and permanently patent ureterosigmoidal ostium along with cystectomy. The resultant ureteral opening into the bowel is not a side opening, but an end opening similar to that found normally in the bladder.

In the first stage of the operation the abdomen is opened through a paramedian incision and the small intestines are displaced by means of the Trendelenburg position to clear the pelvis. The ureters are identified at the iliac-vessel crossing and exposed with incisions extending several centimeters caudad. They are freed but not thoroughly cleaned so as not to disturb their blood and nerve supply. Each ureter is implanted into the contiguous portion of the sigmoid.

The sigmoid is lifted, straightened, and rotated so that the anterior longitudinal band lies opposite the right ureter. A 5-cm. incision extending through the serosa and muscularis is made into the colon along the anterior band, and a 0.5-cm. lateral flap and a 1-to 2-mm. medial flap are dissected free. The lateral flap is raised with tension sutures, the ureter gently slid into a submucosal position, and the bowel incision is closed with 0000 chromic catgut. The closure must be free of constriction and the ureter free of sutures. The midportion of the buried ureter is peritonealized.

The sigmoid is now swung to the left and rotated so that the anterior band approximates the left ureter and this ureter is similarly embedded. Because the sigmoid will tend to swing to the right, it is attached to the posterior peritoneum at the ureteral exit. The abdomen is closed. Figure 1 graphically demonstrates the final result of the first stage.

After from three to four weeks, with the patient in suitable condition, the abdomen is opened through a midline incision and the pelvis cleared of the intestines. The ureteral exit from the sigmoid is identified and the parietal peritoneum is separated from the sigmoid if necessary. The emerging ureter is followed for 3 cm. and divided between clamps. The lower stump is ligated and the upper stump freed. A purse-string suture is applied to the sigmoid around the ureteral exit. The ureter is split, held with clamps, and the electrode is introduced. The creation of the ureteral ostium is depicted in Figure 2. A minimal of current is used with the electrode so that unnecessary destruction of tissue is prevented. The ureteral stump is then doubly tied, carbolized,

and inverted with the previously placed purse-string suture and reinforcing silk sutures in the bowel. This procedure is duplicated on the opposite side and the abdomen is closed following total cystectomy.

During the past three years 29 cases have been treated with the described operation. Twenty-six patients had extensive vesical carcinoma, 2 being inoperable, and the operation was considered only as palliative. Of this group 3 died as the specific result of the ureterointestinal anastomosis, 1 because of an error in technique, 1 from upper urinary-tract infection, and the third from peritonitis following leakage of the ureteral stump. The last complication led to the subsequent double ligation of the ureteral stump, as described, and reinforcing silk sutures. The mortality reported in this series is far removed from that in the reports of Hinman in 1936 and 1939 in which he stated that surgeons doing ureterointestinal implantation reaped a mortality of between 47 and 50 per cent. Of the remaining 26 patients 2 died of unrelated conditions and 4 died from malignancy.

Rectoabdominal palpation under anesthesia is recommended as an aid in gross classification of bladder tumors. Figure 3 demonstrates the method and, as may be seen, only small tumors of the anterior vesical wall elude the examiner. The author divides vesical tumors into three groups:

Noninfiltrating tumors. Cystoscopic examination establishes the diagnosis in this group and rectoabdominal palpation reveals the soft cushion of the bladder wall over the mass. Cystofulguration is the treatment of choice in this group.

Infiltrating tumors completely confined to the bladder wall. When cystoscopic evidence suggests vesical-wall infiltration, a biopsy under general anesthesia is indicated as well as rectoabdominal palpation. In the event of deep invasion of the muscle wall by the tumor, the palpating rectal finger records an indurated mass. Also, the palpable vesical mass is larger than the cystoscopically visualized tumor. In these cases the patient's age and general condition will determine the management. For cystectomy the tumor must be confined to the bladder wall and be freely movable between the rectal and abdominal fingers except when the tumor occupies the vesical base which is normally relatively fixed. In addition, a correlation of the gross and microscopic characteristics of the tumor may aid in determining the probability of cure by radical operation. However, at operation the case may be found to be inoperable because of metastasis, but the patient may obtain considerable relief from pain in the bladder and urethra.

Infiltrating tumors with perivesical extension, with or without metastases. A cure by cystectomy is impossible in this group, which is characterized by (1) a large hard irregular mass projecting well beyond the bladder wall, (2) thickening and induration of the inferolateral ligaments in neoplasms of the base, (3) fixation of the mass to the bony pelvis or to other perivesical structures which are not removable at operation, and (4) distant metastases.

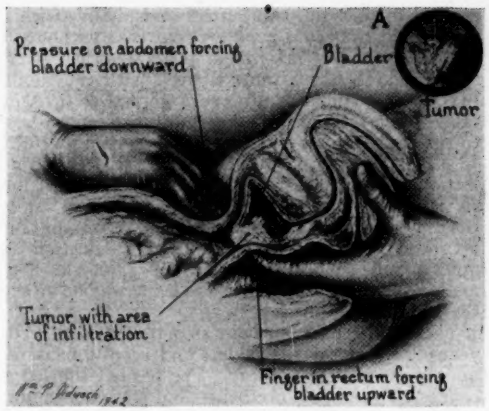


Fig. 3. Technique of rectoabdominal palpation in the male under anesthesia. Relaxation of abdominal wall and perineum makes possible thorough digital exploration of bladder. Infiltration of bladder muscle is felt as a hard mass and its size determined in three dimensions. A, Cystoscopic appearance of small papillary carcinoma. Although infiltration is present, its extent can be determined only by bimanual palpation.

Diversion of the urine in this group is advocated in incapacitating and uncontrollable vesical symptoms. In these cases a one-stage ureterointestinal transplantation is suggested with subsequent cystectomy reserved for instances of persistent vesical hemorrhage and pain. ROBERT LICH, JR., M.D.

GENITAL ORGANS

Cristol, D. S., and Emmett, J. L.: The Incidence of Coincident Prostatic Calculi, Prostatic Hyperplasia, and Carcinoma of the Prostate Gland. *J. Am. M. Ass.*, 1944, 124: 646.

A study of a large series of cases suggests that the incidence of prostatic calculi in cases of benign hyperplasia and in cases of carcinoma of the prostate is practically identical. This is in disagreement with the commonly accepted dictum that prostatic calculi are rarely found in cases of carcinoma of the prostate gland.

Huhner, M.: A Case of Aspermia Cured by Injections of Androgen. *J. Urol.*, Balt., 1944, 51: 178.

The commonly confused terms of aspermia and azoospermia are defined. In aspermia there is no ejaculation during coitus although sexual desire and the act are undisturbed.

The patient was a markedly obese 30-year-old male who presented posterior urethral congestion and pus cells in the prostatic and seminal vesicle strippings. Testosterone propionate was administered in a dose of 10 mgm. at first, which was in-

creased to 50 mgm. three times and finally twice a week. This was continued for six weeks without ill effects. Perandren in 25 mgm. doses was then given approximately three times a week with the result that in approximately six weeks normal coitus had taken place twice. The perandren was reduced and coitus became weaker; perandren was then given in 50 mgm. doses with a return to normal after six injections during one month, and this continued for six months. The relapse was controlled by additional perandren. The disappearance or diminution of spermatozoa during perandren medication is quickly relieved following withdrawal of the hormone. No deleterious effect was evidenced on either the prostate or testicles.

The second case reported was that of a thirty-two-year-old hypertensive who had undergone a bilateral Smithwick sympathectomy. The patient showed a congested posterior urethritis and verumontanum and had the feeling of ejaculation, but there was none. Perandren in 50 mgm. doses was administered three times a week without result and so they were increased to 100 mgm. with the production of dizzy and vomiting spells along with very strong morning erections. Discontinuation of therapy was advised. There was no harmful effect on the prostate or testicles.

ROBERT LICH, JR., M.D.

Gilbert, J. B.: Tumors of the Testis Following Mumps Orchitis. Case Report and Review of 24 Cases. *J. Urol.*, Balt., 1944, 51: 296.

A case of cancer of the right atrophic testicle, which had been involved in the course of bilateral mumps sixteen years previously, is reported. The patient, a thirty-nine-year-old white American business man, had been sterile. Seven years before being seen he suffered a severe muscle strain following exertion which was followed by pain in the right lower abdominal quadrant and leg. Two years previously a testicular swelling was noted in the originally small right testicle. At operation an embryonal carcinoma with lymphoid stroma was found. Surgery was supplemented with x-ray treatment to the abdomen and chest and the patient was free of disease four years after operation.

Twenty-four similar cases are reviewed from the literature comprising 5,500 records of testicular tumor. Three cases of bilateral testicular tumors are abstracted.

The average age of the 24 patients was thirty-five years and the time interval between the orchitis and the tumor was twelve years. The interval between tumor onset and surgery was five and one-half months. Alleged trauma was claimed in only 4 cases. The tumors were classified as follows: 13 seminomas; 9 teratoids, and 2 miscellaneous tumors. One patient with a unicellular tumor survived seven years after surgery and 1 with a teratoma, five years.

The survey concluded that no evidence suggested any relationship between mumps orchitis and the incidence of testicular tumor. This conclusion was based on the fact that in the 5,500 cases reviewed, the history of mumps orchitis with atrophy was found in 0.5 per cent, while 80 of the tumors described (1.5 per cent) followed nonspecific atrophy, an incidence three times greater than that of mumps atrophy.

ROBERT LICH, JR., M.D.

MISCELLANEOUS

Schneider, D. H.: Duodenal Fistula after Kidney Surgery. Case Report. *J. Urol.*, Balt., 1944, 51: 287.

In reviewing surgery of the right kidney at the Charity Hospital in New Orleans, the author found that postoperative intestinal fistulas constituted a 1.1 per cent complication, while duodenal fistulas occurred 4 times, or in 0.7 per cent. One case of duodenal fistula following nephrectomy in which the patient recovered and 3 cases in which the patients died are reported, as well as 2 cases in which the patients also died but there was some doubt as to the nature of the condition.

Conservative management of these cases necessitates attention to fluid balance, blood chlorides, glucose, proteins (by means of plasma, serum, blood), and parenteral base. Some of the body fluid loss can be collected and refed through a duodenal tube. Local tissue injury is prevented by acid neutralization of the alkaline duodenal secretion and the skin is protected by ointments.

Radical management consists of immediate or late suture of the intestinal tract plus gastroenterostomy, with or without pyloric occlusion and jejunostomy. Radical therapy depends on the patient's condition, the situation at hand, and the surgeon.

A forty-six-year-old white female began draining bile from the operative wound the day following a difficult nephrectomy. The patient was placed on a high protein diet, and aluminum paste was thickly applied to the wound. A catheter drained the wound with Wangensteen suction, while a constant drip of decinormal HCl was started into the wound at 40 drops per minute. Vitamin K and indicated parenteral fluids were administered. The catheter was removed on the twentieth day and the wound closed on the thirty-fourth postoperative day. It is suggested that, on occasion, subcapsular rather than extracapsular nephrectomy may prevent this complication.

ROBERT LICH, JR., M.D.

Westphal, R. S.: Report of an Outbreak of Gonorrhea at a Boys' School. *N. York State J. M.*, 1944, 44: 493.

An epidemic of gonorrheal urethritis is reported in a boys' school located in New York which involved at least 17, or 25.4 per cent, of the 67 individuals attending the school. The boys, who were colored, had committed misdemeanors and were sent to this school, which had been established by philanthropic individuals and organizations for the purpose of rehabilitation of underprivileged children. The boys varied in age from nine to sixteen years and 84 per cent were between ten and thirteen years.

The initial case was infected as the result of intercourse with a girl, but in the remaining cases the infection developed from contact with individuals who had gonococcal proctitis. The epidemiology is carefully recorded in the article.

The 17 cases were confirmed by laboratory tests which included culture. In 6 instances the diagnosis was based upon the history and clinical findings; in 6 others it was confirmed by laboratory tests, and in the remaining 5 individuals it was confirmed clinically.

The condition was treated by isolation and 2 gm. of sulfathiazole given daily for ten days to all members of the school. No further spread occurred and those infected demonstrated 3 negative clinical and laboratory examinations at subsequent dates.

ROBERT LICH, JR., M.D.

Harrison, J. H., Botsford, T. W., and Ross, F. P.: The Treatment of Resistant Gonorrhea with Induced Hyperthermia Supplemented by Sulfonamide Therapy. *J. Urol.*, Balt., 1944, 51: 215.

The authors' study is based upon the first 300 patients in their military hospital to receive combined fever and sulfonamide therapy for gonorrhea. These patients had failed to respond to other forms of treatment, which included intensive sulfonamide therapy in every instance.

Two hundred and fifty-three patients were cured by this method of treatment. Of these, 203 were cured following only one treatment; 42 were cured after a second course of treatment which usually lasted for a period of eight hours at a similar temperature; 5 were cured after a third course of treatment; and 3 were cured after a course of four treatments. The repeat treatments were administered at intervals of at least a week apart.

Fifteen patients were too apprehensive and disturbed to tolerate a single adequate course of fever therapy, and in these cases the treatment was considered a total failure. In 22 patients, the condition was improved but not cured, despite the fact that treatments were repeated in all such cases. Though clinical improvement occurred in each of these cases, positive smears or cultures were obtained from the urethra or prostate after one or more treatments. All of the patients in this group were ultimately discharged from the hospital as cured of gonorrhea after varying periods of time. In 10 patients who had had one or more courses of therapy, the treatment proved to be a total failure; this group either showed no improvement at all, or seemed actually worse after the treatment. Altogether, treatment by means of this method must be considered as having failed in 47 cases.

Excluding the patient who died, 84 per cent of the first 300 patients were cured of gonorrhea according to the criteria for cure previously outlined. A total of 426 fever therapy treatments were given to this group of patients. The average length of time in the fever cabinet for each patient, per treatment, was eight and one-half hours. The average period of hospitalization following the cure of the gonorrhea by fever therapy was thirteen days. During this time the various tests for cure were carried out while the patient was getting into condition for his return to duty. Upon discharge, he was returned to full military duty.

JOHN A. LOEF, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Faget, G. H., and Mayoral, A.: Bone Changes in Leprosy; A Clinical and Roentgenological Study of 505 Cases. *Radiology*, 1944, 42: 1.

The usual and best known bone changes in leprosy occur frequently in the neural form of the disease and are manifested by slow bone absorption in the phalanges, metacarpals, and metatarsals. These changes are of a neurotrophic nature, and similar findings may occur in syringomyelia, Raynaud's disease, and tabes dorsalis.

The mycobacterium leprae is not found in the bones in such cases. The distal phalanges are first involved in the hands, and the bones of the metatarsophalangeal joints in the feet. Since these are the areas most subject to trauma in the extremities, it appears that this factor is of importance in localizing the bone destruction. In the hands there may be bone absorption with little or no soft-tissue atrophy and contractures. The converse may also be found. This is probably dependent on whether the neurotrophic or the motor neurones are primarily attacked by the disease. Less well known bone changes also occur occasionally in the lepromatous, cutaneous, or nodular form of the disease, and are manifested mainly by enlarged nutrient canals and small cyst formations. These changes are believed to be due to the direct action of the bacilli or to aseptic necrosis from obstruction of the nutrient arteries by leprous endarteritis.

In the mixed forms of the disease both types of bone pathology may be found. Bone changes in leprosy are not pathognomonic except in the late stages. The author found roentgenographically demonstrable bone changes in 29 per cent of a series of 505 patients. Changes were present in 5.6 per cent of the lepromatous type, in 64 per cent of the neural type, and in 33 per cent of the mixed cases. Injections of radiopaque materials into peripheral arteries both in the living and at autopsy convinced the authors that there was no significant vascular disturbance to explain bone changes in the neural type. In the advanced lepromatous and mixed cases, however, vascular lesions occur. When trophic ulcerations are present, secondary infection may reach the bones, and osteomyelitis may still further accentuate the pre-existing bone pathology.

CHESTER C. GUY, M.D.

MacGowan, T. J. B. A.: Adolescent Kyphosis. *Lancet*, Lond., 1944, 246: 211.

A short review of the anatomy and physiology of the spine is given. The weight of the body is transmitted from vertebra to vertebra through the intervertebral discs. The disc is an elastic plate containing a central incompressible nucleus. The axis of motion and weight bearing is in the region of the inelastic nucleus. When the nucleus is destroyed the axis of weight bearing is shifted to the anterior borders of the vertebrae or the posterior vertebral joints.

In adolescent kyphosis the vertebral nucleus is destroyed before ossification of the vertebral body is completed. The nuclear tissue then prolapses into the vertebral body. The weight-bearing axis is transferred anteriorly or posteriorly. During adolescence the epiphysis will be subject to trauma leading to growth disturbances in the epiphysis, wedge formation of the vertebral bodies, and spur formation around the anterior edges. The degenerated nucleus and disc may also share in this ossification. Kyphosis with the peak over the sixth thoracic vertebra occurs in children whose epiphyses have recently appeared and are actively growing. This occurs in girls aged twelve or in boys aged 14.

There are three basic types: (1) mobile kyphosis, (2) fixed kyphosis, and (3) fixed arthritic kyphosis. The mobile stage merges gradually into the last stage of adolescent kyphosis. There is no constant type of person affected. The child stands with a stoop, and a prominent abdomen or cervical protrusion. Muscle inco-ordination is common. In the early mobile stage the kyphosis can be corrected by voluntary effort and is compensated by lumbar lordosis.

Shortening of the hamstring muscles contributes to the formation of kyphosis. Damage to the thoracic spine will result when the child is encouraged to do toe-touching exercises. In these exercises the back is used as a lever to stretch the tight hamstrings with the hip joints as fulcra.

In the rigid type the spinous processes are prominent and are flanked by usually well developed spinal muscles. Absolute rigidity is present. No voluntary or passive correction is possible. Secondary scoliosis is found in 27 per cent of this series. Tenderness to palpation is very rarely observed. However, if the patient is allowed to jump from a height of a few feet an unpleasant jar is experienced in the spine.

The blood picture of patients of all three groups were analyzed and found to be normal.

The author disagrees with the opinion that this condition is found almost entirely in boys. Five types are differentiated on etiological bases:

1. The debilitated, asthmatic type. A typical child is a thin, poorly developed boy with chronic chest disease and with a poorly calcified skeleton.
2. The fat, overgrown, "endocrine" gigantic type. There may be some skeletal ossification defect possibly from pituitary deficiency.
3. The congenital type.
4. The tall, well built, precociously muscled "apprentice" type. This patient usually is doing much too heavy work. The additional strain is sufficient to cause prolapse of the nuclei.

5. The traumatic type is found in patients with a definite history of trauma not sufficient to cause fracture of the vertebrae.

The author gives a detailed description of the roentgenograms of normal spines at various ages. The absence of pathological changes in the intervertebral discs does not indicate absence of nuclear prolapse or other soft-tissue changes. Nuclear prolapses must be surrounded by compact bone to be roentgenologically visible. There can be considerable nuclear prolapse and soft-tissue changes in the surrounding ligaments without signs in the film.

The late arthritic changes include thinning and calcification of the intervertebral discs, formation of anterior vertebral spurs, ossification in the posterior ligaments, and calcification in the soft tissues in or around the vertebral discs.

A diagram illustrating the different stages of adolescent kyphosis is presented.

Some changes in the epiphyseal area are due to hypercalcification and rarefication and give the appearance usually labeled as osteochondritis.

GEORGE I. REISS, M.D.

Bergmann, E.: Role of Aseptic Bone Necrosis in Hip Lesions. *Am. J. Surg.*, 1944, 58: 218.

The arrangement of vessels supplying blood to the femoral head is unique. It is, therefore, in the hip joint, more than anywhere else in the skeleton, that the sequelae of impaired blood supply can so readily be observed. Indeed, what is commonly known about aseptic necrosis of bone is largely due to studies of the pathological status of the femoral head.

Among the various causes of impaired blood flow to the upper end of the femur, those of traumatic origin are seldom the object of controversy since they are best understood.

The true significance of aseptic necrosis of the head comes to light after healing of the fracture. In a comparatively small number of cases, for which no exact figures can be given, but which may be estimated as ranging from 10 to 20 per cent, a pathological fracture develops, with a depression of that part of the head which is mainly subjected to weight bearing. This "late damage" usually occurs from one to two years after consolidation of the fracture, but its groundwork has been laid at the moment of the injury. The collapse of this wedge-shaped sector of the upper quadrant may be followed by its separation from the rest of the head, a process not unlike the detachment of a joint mouse in osteochondritis dissecans. The fact that this collapse occurs at a time when all necrotic bone should long ago have been replaced led Phemister to assume that the process of repair may stop before its completion. It may well be that such areas of arrested repair occur much oftener than they become evident through their collapse. It appears that healing in valgus position of the head favors the infraction of these residual necroses. For it is in these cases that the head protrudes laterally and out of the acetabulum, leaving only a narrow sector for carrying the body weight.

This late collapse may occur after any of the approved methods of treatment. It has been observed following the Whitman procedure; it may be seen after insertion of a Smith-Petersen nail, as well as after use of an autogenous bone transplant.

In all these cases bony union of the fracture preceded the ultimate collapse of the head. Only then do the mechanics of weight bearing come fully into play.

Nothing, it seems, can be done to prevent the ultimate breakdown of an area of defective repair, nor can its occurrence be predicted. Equally undecided remains the question whether one method of treatment is more likely to entail ultimate collapse than another. As in the case with internal splintage in general, the superiority of an autogenous bone graft over nail or screw is more a matter of personal belief than of proved evidence. For the object of immediate fixation the metallic device is as efficient as the bone peg. Whether the latter carries an additional biological effect is difficult to say. Greater statistical material and more specimens must be studied.

The pathological disorder of the femoral head is largely one of aseptic necrosis. Its significance in fractures of the femoral neck is generally appreciated. The role it plays in traumatic dislocation has in recent years been more and more recognized. From epiphyseal separations ischemic necrosis may or may not ensue. Congenital dislocation may also entail circulatory impairment for the femoral head. While in Perthes' disease the roentgenological and pathological train of events is well known, the cause of the epiphysealnecrosis is still a matter of conjecture. The same is true in osteochondritis dissecans and in those cases of osteoarthritis which are characterized by collapsed and more or less demarcated areas of necrotic bone in the weight-bearing sector. Embolic interruption of circulation to the femoral head is undisputed in caisson disease alone.

Numerous photomicrographs and photoroentgenographs are presented.

ROBERT P. MONTGOMERY, M.D.

Schwartz, L. A.: Clinical, Histopathological, and Inheritance Factors in Peroneal Muscular Atrophy (Charcot-Marie-Tooth Type). *J Michigan M. Soc.*, 1944, 43: 219.

The historical background of the progressive types of muscular diseases is thoroughly discussed, as well as the etiological factors, symptomatology, pathologic changes and differential diagnosis.

The genealogy of the "P" family is presented; it covers five generations comprising 123 individuals, 26 of whom (13 males and 13 females) were affected. This family shows no improvement in the course of the disease; it has run a gradual but inevitable course.

A case presentation of "H.P." male, forty-two years of age, is made in detail. Treatment has been thorough, mostly in the form of vitamins. The patient has made a written statement that he was remarkably benefited by such therapy.

It is the author's conviction, since subjective improvement is the best that can be hoped for with the present facilities for treatment, that peroneal atrophy should be eradicated from society by means of education in contraceptive measures among family members in whom such affliction exists. It is the only course open which is absolute in controlling the spread of this disease.

RICHARD J. BENNETT, JR., M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

New, G. B., and Erich, J. B.: Bone Grafts to the Mandible. *Am. J. Surg.*, 1944, 63: 153.

All bony defects interrupting the continuity of the mandible, whether the loss of bone is due directly to the injury or indirectly to necrosis following an infection, disturb to some degree the natural relation of the upper and lower dental arches, the normal masticatory mechanism, and the symmetry of facial contour. Such maxillary changes call for readjustments and in the majority of instances there is little question but that a bone graft offers the most satisfactory method of repair.

There can be no doubt that much of the success of maxillary bone grafting depends on a most painstaking type of aseptic surgical technique and on the construction of dental and mechanical appliances which will maintain adequate immobilization of the bony fragments during the healing period. At times the factors present ultimately lead to poor results.

In most instances, failures of bone grafting are the result of infection. Unfortunately, the source of some infections about bone grafts is not obvious. A latent infection is a constant potential danger in bone grafting. It is imperative, therefore, that sufficient time elapse between the occurrence of the bony defect and the bone-graft operation to free the tissues of all pathogenic organisms. Just how long the period between these two events should be is a matter of conjecture. It is the authors' opinion that the insertion of a bone transplant to correct a mandibular bony defect of traumatic origin is best deferred for three or more months following the injury.

Shortly after the original injury it is desirable to construct for each individual case an appliance which will maintain the fragments in their normal positions. What type of mechanism should be constructed depends entirely on the number of teeth present in each fragment.

The mechanical devices for fixation of the fragments must be applied the day before the insertion of the transplant. The type of fixation to be used in each case depends entirely on the teeth which are present in the segments of the lower jaw and in the maxilla.

Before one proceeds with the implantation of a bone graft into the mandible, all of the appliances necessary for fixation of the fragments must be in proper position. By blunt dissection, the ends of the fragments are exposed and with periosteal elevators the soft tissuse surrounding the ends of the fragments are pushed aside.

Following exposure of the outer (buccal) and inner (lingual) surfaces, as well as the lower border of each fragment, the free end is ground down and beveled outward for a distance of about 2 cm. The grinding is continued until bleeding occurs from the cancellous portion of the bone.

By means of rongeurs and bone chisels, the transplant itself is cut to the desired shape and its ends are beveled to approximate the ends of the bony fragments. Two holes are drilled through the ends of the fragments as well as through each end of the bone graft and by use of heavy dermal catgut the graft is tied to the fragments. The authors believe that it is better to use some material, such as catgut, which is absorbable. In the average case, immobilization is maintained for from six to eight weeks.

The most common causes for failure of a bone graft to unite to a fragment are (1) poor apposition of the graft to the fragment, (2) insufficient surface contact between the ground-down end of the fragment and the end of the graft, and (3) sclerosis of the end of the fragment.

McLaughlin, H. L.: Lesions of the Musculotendinous Cuff of the Shoulder. The Exposure and Treatment of Tears with Retraction. *J. Bone Surg.*, 1944, 26: 31.

The incision of choice for approach to the shoulder joint should provide adequate exposure, insure a satisfactory scar, and avoid paralysis of the deltoid muscle from interference with branches of the axillary nerve. A superior approach based on the "saber-cut" incision fulfills these requirements. It extends parallel to the suspender line from the back to from 3 to 5 cm. anterior to the acromium and is situated just lateral to the acromioclavicular joint. The deltoid fibers are split from above downward near the anterior border of the muscle and the coracoacromial ligament is divided. This allows exposure of the subdeltoid bursa and most of the musculotendinous cuff. For complete exposure of the joint region the skin incision is extended posteriorly and the outer portion of the acromium is separated by an osteotome. The musculotendinous cuff is then incised longitudinally in the aponeurosis between the subscapularis and supraspinatus tendons. Through this exposure it is easy to execute any of the common shoulder-joint operations, including transplantation of the biceps tendon. In closure of the incision interrupted fine silk sutures are used and the outer portion of the split acromium is excised and discarded, the proximal portion being beveled off. If the outer fragment is not removed it can be replaced by soft-tissue sutures only, with assurance of bony union. Removal of the fragment is generally recommended as the postoperative results are better than if it is retained. There is no particular postoperative care although these patients are advised against active abduction movements opposed to gravity for about two weeks.

The author's observations are based on 275 operations performed for lesions of the musculotendinous cuff and associated structures. No two lesions are ever identical and the technique of cuff repair varies with the location and extent of the pathological changes found. Ruptures of the cuff are classified as incomplete or complete. The latter may be purely transverse, in which case they are uncommon; purely vertical, in which case they are generally found in young persons, and always between the subscapularis and supraspinatus tendons; they may appear as tears with retraction, in which case they result from repeated insults and are the least well understood, and they may appear as massive avulsions. In general, tears should be repaired by side-to-side suture of the opening and no attempt made to restore normal anatomical positions past the point of tension. If the tear cannot be closed at its lower end by side-to-side suture, the articular cartilage is removed from the humeral head and the cuff approximated to it by sutures passed through drill holes emerging at the outer surface of the greater tuberosity. Additional mattress sutures to the cuff or bone may be necessary. All suturing is done with the arm at the side. Massive avulsions are also sutured to the humeral head, and this may be combined with a Nicola type of transplantation of the long head of the biceps in cases in which extra stability seems advisable.

Most of these cases are of long standing, at least as regards the original injury, but in general a two weeks' period of conservative therapy is advisable before operation is undertaken in acute injuries suggestive of cuff tear. Eight cases with massive tears and 32 cases of retracted tears of the musculotendinous cuff are reported. Most of the patients resumed their regular work in from two to three months.

Physical therapy after operation will do more harm than good if the patient is allowed to depend on it rather than on his own active efforts to rehabilitate himself. In any event all physical therapy measures should be supervised by the operating surgeon.

Fine wire was used to suture the cuff in 2 cases, and in both it had to be removed later because of a resulting chronic bursitis. Fusion of the shoulder is not warranted for massive avulsions of the cuff.

CHESTER C. GUY, M.D.

Duthie, J. J. R., and Macleod, J. G.: Meniscectomy in Soldiers; Review of Cases Discharged from an Army Convalescent Depot. *Lancet*, Lond., 1944, 246: 182.

Immediate results of rehabilitation of 179 soldiers after unilateral or bilateral meniscectomy and results from six months to one year after return to active duty are reported. The patients discharged in a very good physical condition (Category A-1) had undergone an assault course of reasonable difficulty, had completed a three-mile cross-country run, and a fifteen-mile route march.

Ninety-two per cent of the men in category A-1 admitted to the convalescant depot were discharged in category A-1. Twenty-seven per cent of this group were down-graded below grade A-1 after from six months to one year of active duty. Eighty per cent of the men in categories below A-1 were discharged in the same categories, 13 per cent were up-graded, and the remainder were down-graded. After from six months to one year of active duty, 39 per cent were down-graded further.

GEORGE I. REISS, M.D.

FRACTURES AND DISLOCATIONS

Moore, A. T.: Blade-Plate Internal Fixation for Intertrochanteric Fractures. *J. Bone Surg.*, 1944, 26: 52.

The blade plate is an angled single piece of metal, the upper portion being a blade to be driven through the trochanteric region and neck into the femoral head, and the lower portion a plate to be screwed to the shaft. It is similar in principle to the Thornton and Neufeld nails. Blade plates are now available commercially and come in various sizes. They are well adapted for internal fixation of many fractures of the trochanteric region and upper portion of the shaft of the femur. It is a mistake to believe that all intertrochanteric fractures do well regardless of the method of treatment. Use of the blade plate insures accurate reduction, early mobilization, and shorter hospitalization. An ingenious instrument is described to insert or withdraw the blade portion. This is best done under roentgenographic control.

This type of internal fixation has been used by the author in 41 patients with intertrochanteric fractures of the femur. There were no deaths and no cases of nonunion.

CHESTER C. GUY, M.D.

Charnley, J.: Fractures of the Femoral Shaft; Mechanics of Reduction and Fixation. *Lancet*, Lond., 1944, 246: 235.

An analysis is made of the mechanical factors underlying the reduction and fixation of fractures of the femoral shaft, and a description of a system made up of parts of existing methods of treatments which seem to satisfy this analysis is given.

It is thought that those methods in which traction is used as the principal corrective force are essentially unsound and are particularly prone to allow late deformity when the initial traction force is reduced to physiological levels.

The sliding traction method used with the knee flexed is generated by weights and pulleys. The limb is cradled in a Thomas splint, suspended to a Balkan beam, slung by the Hamilton Russell method, or placed on a Braun splint. Tension in this apparatus is governed by the amount of the weights, and therefore does not necessarily agree with the demands of the muscles at any particular moment. The author believes that the only absolute indication for weight traction is the closed transverse fracture with gross swelling of the thigh.

All other cases are best treated by simple fixed traction. Under fixed traction, the tension in the

system at any particular time is governed by the demands of the muscle, because it is produced by the muscles and not by the surgeon. In this method it is necessary to secure full length under anesthesia with complete relaxation of the thigh muscles, and length is then maintained by fixing the traction cords to the foot of the splint. On recovery from the anesthesia, the fracture is immobile and the returning spasm minimal. From this moment onward the tension in the apparatus diminishes progressively and is never more than is called out by muscular tone. The reasons given for this are that: (a) the traction in this method is not used to correct deformity or produce fixation; and (b) the scar tissue around the fracture becomes strong enough to resist the tendency toward shortening.

Several small appliances which the author has found useful in the employment of this system of fixed traction are described.

Weight traction and fixed traction are immediately interchangeable without any interference in the direction of the lines of force or disturbance of the fracture. EMIL C. ROBITSHEK, M.D.

ORTHOPEDICS IN GENERAL

Spurling, R. G., and Thompson, T. C.: Notes on the Diagnosis of Herniated Nucleus Pulposus in the Lower Lumbar Region. *Surgery*, 1944, 15: 387.

Forty per cent of the patients with a herniated nucleus pulposus in the lower lumbar region give a history of trauma precipitating the first attack of pain. Backache without radiation of pain into either leg seldom is caused by herniation of the nucleus pulposus. Pain is usually present along the entire course of the sciatic nerve. The points of maximum intensity are the gluteal region, the posterior thigh, and the lateral aspect of the leg or ankle. The gluteal region is the area to which the pain produced or intensified by coughing, straining, or sneezing is referred. The patient with severe sciatic pain usually keeps the knees flexed. Any bending movement, sitting, or exercising usually exaggerates the pain.

During examination most patients with a herniated nucleus pulposus have a straight lumbar spine with obliteration or reversal of the lumbar lordosis. Most patients show listing away from the side of the sciatic pain. In almost every instance the pelvis on the affected side is higher than on the unaffected side. Movements of the lumbar spine are usually limited, especially in flexion. Extension of the spine is often painful. The erector spinae muscles may be spastic and the spasm may be greatest on the side opposite the lesion. Light percussion or pressure at the level of the lesion will usually demonstrate an area of localized tenderness. Deeper percussion just to the side of this tender area may cause radiating pain into the gluteal region or leg. Lateral bending is often restricted, especially on the painful side.

Two forms of stimuli are sufficient to demonstrate gross sensory involvement; a light touch with the finger tips and painful sensation with pin prick. In questionable cases, testing with heat and cold will demonstrate sensory loss.

Diminution or absence of the ankle jerk on the affected side occurs in at least 80 per cent of herniations of the lumbosacral discs, but in only 25 per cent of herniations at the 4th lumbar disc.

The straight-leg raising test is a valuable index of the degree of sciatic pain. The angle at which pain appears may also be used as a reliable index for judging the progress of the case. The Lasègue's test is a useful refinement. These two tests are almost always positive in lumbar herniation of the nucleus pulposus producing sciatic pain. When the nonpainful thigh is flexed upon the abdomen, relief of pain in the affected leg is experienced. The jugular compression test is of value in some cases. A positive jugular compression test is pathognomonic of an intraspinal lesion.

Many lumbar herniations of the nucleus pulposus can be accurately localized on the basis of clinical findings alone. The characteristic findings for herniations of the nucleus pulposus are seen in the 4th lumbar interspace.

The differential diagnosis is quite important and must be carried out with many other closely related conditions in mind. Myelography is of value in about 40 per cent of the cases of lumbar herniation of the nucleus pulposus which are not diagnosed by clinical findings alone.

Pantopaque, a new myelographic medium, combines the desirable qualities of lipiodol and thorotrast and is more easily removed than the latter by aspiration. The technique of pantopaque myelography is given in detail. This substance can be withdrawn quite easily following its introduction into the spinal canal. The whole examination requires but from fifteen to twenty minutes, including the injection and removal of the drug.

RICHARD J. BENNETT, JR., M.D.

Bingham, R.: Painful Feet: Congenital Insufficiency of the First Metatarsal Segment as a Cause among Soldiers Recently Inducted into the Army. *J. Am. M. Ass.*, 1944, 124: 283.

Painful feet are divided into two groups: (1) traumatic lesions of the feet, severe strains, sprains, and fractures, and (2) postural foot disorders and skeletal abnormalities. A congenital insufficiency of function of the first metatarsal segment is frequently unrecognized. About 10 per cent of all patients with foot disorders of the second class were found to have this pathological condition during a six-month survey in a station hospital in Mississippi.

The principal anatomic or functional insufficiency of the first metatarsal segment of the foot is the underlying cause for the production of symptoms. This is due to a congenital developmental defect of the first metatarsal shaft which may be (1) shortened so that it cannot bear its share of the weight thrust from the sole of the foot, (2) relaxed, so that it is dorsally hypermobile and can be displaced upward

to cause a functional shortening; (3) abducted to a varus position, out of the weight-bearing line of the longitudinal arch; (4) functionally shortened by posteriorly displaced sesamoids; or (5) failing to bear a proper share of the weight of the body because of a combination of these deformities. The condition is usually bilateral and the symptoms and changes in foot structure vary with the severity of the syndrome.

When there is instability of the first metatarsal segment then (1) the second metatarsal bears an increased amount of the body weight which results in enlargement of the shaft, thickening of the cortex, painful pressure under the second metatarsal head, and strain and aching in the midtarsal joints; (2) callus formation develops under the distal head of the second metatarsal, and to a less extent at the third and fourth; (3) there is a tendency of the foot to pronation with lowering of the longitudinal arch.

The symptoms are an aching and burning pain under the callus in the region of the second and third metatarsal heads. Longitudinal arch pains, swelling, and redness at the midtarsal region, and aching of the calf, hamstring, and back muscles are frequent.

Some of the soldiers had tried arch supports or metatarsal pads without much relief. An x-ray check is advisable in every case in which this pathological condition is suspected. A shortness, relaxation, and hypermobility of the first metatarsal head may be further exaggerated by a posterior displacement of the weight-bearing sesamoid bones. Acute symptoms are most often due to a traumatic synovitis of the second and third metatarsophalangeal joints and the middle cuneiform joints. Chronic symptoms come from secondary hypertrophic osteoarthritis. The inadequate support of the short and relaxed first metatarsal segment weakens the medial border of the longitudinal arch of the foot. This causes pronation, found in many of these cases. The flattening of the longitudinal arch occurs gradually as the result of absence of support.

Roentgenograms of the foot are taken in a standing position centered over the second cuneiform bone. The findings are pathognomonic. The first metatarsal is shortened, compared with the second, and is very frequently in varus. The cortex is thinner than normal and may appear atrophic. Osteoarthritis of the first metatarsophalangeal joint is an occasional finding. The sesamoids may appear displaced posteriorly or abducted. A lateral view may show a relative dorsiflexion of the first metatarsal shaft. Relaxation is further evidenced by a widening of the joint space between the first and second metatarsals and the first and second cuneiforms. The second metatarsal shaft is hypertrophied and enlarged. The cortex is thickened and there is evidence of increased functional stress. The third and fourth metatarsal shafts may show similar changes to a less degree.

The treatment is restoration of the weight-bearing function and normal position of the first metatarsal segment of the foot. Specific treatment compensates both for the shortness and the relaxation of the first metatarsal segment, gives support to the medial border of the longitudinal arch, and relieves the symptoms caused by excessive weight thrust on the second metatarsal and midtarsal region of the foot. A "compensating insole" is fitted by shoe size and has a built-in platform which extends out under the head of the first metatarsal pad or bar. This device can be made from a suitable thickness of sole leather. Exercises, contrast and whirlpool baths, and periods of rest and elevation of the feet are used. Of 100 soldiers treated by this method 76 have been able to continue full military duties.

RICHARD J. BENNETT, JR., M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Papper, E. M., and Imler, A. E.: The Use of Phlebography and Lumbar Sympathetic Block in the Diagnosis of Venospasm of the Lower Extremities. *Surgery*, 1944, 15: 402.

Three cases of venospasm of the deep veins of the lower extremity are presented. The presence of a uniform symmetrical narrowing of a vein in the roentgenogram, with adequate concentration of media, is believed to be diagnostic of venospasm. This diagnosis is confirmed if the deformity is completely abolished by lumbar sympathetic block. The concomitant presence of thrombosis and venospasm may be suggested only by the comparison of phlebographic studies before and after lumbar sympathetic block.

It is argued, on the basis of this preliminary work, that the deep veins of the lower extremity are innervated by the lumbar sympathetic outflow, and that it is possible, as demonstrated in the reported cases, for an excessive tone of this outflow to exist and result in spasm of the veins. Denervation of the veins by lumbar sympathetic block removes this excess venous tone, and allows the veins to dilate. These opinions are substantiated by phlebographic evidence. However, it is not known whether sympathetic innervation to the deep veins of the lower extremity is segmental or diffuse.

In the treatment of this condition repeated lumbar sympathetic block should be done at daily intervals, which may possibly abolish the reflex arc. In the cases reported, all the patients received dramatic relief for varying periods of time. Phlebography should be done at intervals in the course of this treatment to observe any permanent change in the status of the venospasm. SAMUEL KAHN, M.D.

BLOOD; TRANSFUSION

King, E. J., Gilchrist, M., and Delory, G. E.: Accuracy of Hemoglobin Methods. *Lancet*, Lond., 1944, 246: 239.

Despite a great amount of work, spread over many years, the determination of hemoglobin remains one of the most unsatisfactory of all analytical procedures. A study was made of the results obtained with selected colorimetric procedures in comparison with iron analysis and oxygen-capacity determinations.

The cyanmethemoglobin procedure was the most accurate method tested, and is recommended for research purposes. The alkaline hematin and carboxyhemoglobin procedures are a little less accurate, but are satisfactory for most purposes when subjected to accurate colorimetry. The alkaline hematin method is preferred for routine use because it estimates abnormal as well as normal hemoglobin.

Other methods are described for determining hemoglobin, but these methods and the color are assessed by reference to an Ilford gray screen and the use of a green light filter. E. C. ROBITSHEK, M.D.

Henshaw, P. S., and Hawkins, J. W.: The Incidence of Leucemia in Physicians. *J. Nat. Cancer Inst.*, 1944, 4: 339.

Early in the history of roentgen and gamma rays, it was noted that excessive exposure of the hands or other parts to high-energy radiation resulted in a dermatitis, which in some cases developed into carcinoma. Since that time, leucemia has been reported in human beings who have worked with high-energy radiation, and because of the similarity in character of the damage caused in hemopoietic tissues to that caused in epithelium, and because epithelial damage in some cases resulted in malignancy, authors were quick to recognize the possible etiological significance of radiation in leucemia.

A review of the literature reveals that two types of evidence suggest that high-energy radiation may increase the incidence of leucemia: (1) the fact that this disease has occurred in radiation workers under conditions resembling those in which radiation carcinoma has developed; and (2) the fact that the incidence of leucemia in animals has been increased experimentally by exposure to x-rays.

This article presents a comparison of the incidence of leucemia in physicians and in the general population. Data were obtained from the death lists of the Journal of the American Medical Association, from the mortality reports of the United States Bureau of the Census, and an unpublished compilation of the United States Public Health Service. Comparisons were made on the basis of (1) the ratio of deaths from leucemia to deaths from cancer, (2) the ratio of deaths from leucemia to total death rates, and (3) the death rates from leucemia.

Leucemia was recognized approximately 1.7 times more frequently among physicians than among white males in the general population. The authors discuss possible discrepancies in the data presented but conclude that while their observations furnish no direct proof that radiation acts to incite leucemia in human beings, they are, nevertheless, in accord with the findings on experimental animals in which exposure to x-rays has been found to increase the incidence of leucemia. PAUL W. SCHAFER, M.D.

Evans, J. A.: Dicumarol Therapy in Thrombotic Emergencies. *N. England J. M.*, 1944, 230: 131.

Since August, 1941, it has been the policy at the Lahey Clinic, Boston, to treat thrombotic emergencies by one or more of the following three relatively new methods: paravertebral procaine sympathetic block, venous section and ligation, and anticoagulant therapy with dicumarol, with or with-

out heparin. Procaine sympathetic block is reserved for patients with thrombophlebitis (phlegmasia alba dolens) in whom swelling exists, in order to abolish constrictor reflexes, promote arteriolar pulsation, enhance oxygenation, restore normal capillary pressure, and thus reduce edema. Sympathetic block probably has no influence on the prevention of pulmonary embolism.

Because of the probable efficacy of anticoagulation therapy in the prevention of postoperative embolism, venous section and ligation are reserved for patients with phlebothrombosis who are more than fifty years of age and who have had a warning benign embolism. The author does not hesitate to employ venous section and ligation in patients with a history of multiple pulmonary emboli, postoperative or otherwise, but he advises a prolonged course of anticoagulation therapy after ligation when there is likelihood of a continuing active phlebitis and the formation of venous thrombi.

Anticoagulant therapy with heparin alone is expensive for the patient and tedious and laborious for the professional staff, but with the advent of dicumarol, which can be given by mouth, there is available a cheap and easy preventive of intravascular clotting. However, heparin is now being given from the first two to five days to cover the immediate emergency period before dicumarol has caused a fall in the prothrombin percentage.

Fifty-six patients with thrombotic emergencies were treated with dicumarol, or with dicumarol combined with heparin, as an anticoagulant. Two deaths occurred (4 per cent), 1 of which can be attributed unequivocally to dicumarol poisoning and hemorrhage. Hemorrhagic phenomena were evident in 8 cases (14 per cent). These complications emphasize the dangers and disadvantages of dicumarol therapy, but the obvious advantages to date appear to outweigh the dangers of this preventive method if adequate laboratory facilities are available and proper precautions are observed.

The principal precaution to be observed is the determination of the morning prothrombin time before the daily maintenance dose of dicumarol is designated.

The combined use of heparin and dicumarol is considered safe only if the doses of heparin are controlled by twice-daily determinations of the coagulation time of the blood, and the doses of dicumarol by daily determinations of the prothrombin time.

One benign and nonfatal pulmonary embolism occurred in a series of 46 cases of venous thrombosis treated with the anticoagulant dicumarol alone or combined with heparin.

This series of 46 cases of thrombophlebitis is not large enough to draw the conclusion that venous ligation is an unnecessary procedure. If a patient is more than fifty years of age, and has had a warning benign pulmonary embolism, venous ligation is still indicated. If statistical proof can be accumulated from other workers in this field, venous ligation may prove unnecessary except in rare cases of recurrent emboli occurring in spite of anticoagulation therapy.

JOSEPH K. NARAT, M.D.

Cronkite, E. P., Deaver, J. M., and Lozner, E. L.: Experiences with the Use of Thrombin With and Without Soluble Cellulose for Local Hemostasis. *War Med.*, Chic., 1944, 5: 80.

Any agent which will help the surgeon in the management of hemorrhage will be a significant aid in surgical technique since it will save time, reduce the number of ligatures, and will possibly open up new avenues of approach in the surgical treatment of the liver, of vascular tumors, and of the brain. The authors present their experiences with the use of a new hemostatic, thrombin, either with or without oxidized gauze. Both rabbit and human thrombin was used.

They recommend that thrombin be sprayed or flooded onto the surface of the wound, or be applied on soaked soluble cellulose pads with or without pressure. Before application of the thrombin the wound bleeding should be controlled by pressure, tension, or, in the extremities, by the use of tourniquets, and this hemostasis should be maintained for several minutes after application of the hemostatic agent. In operative incisions the authors report that thrombin stops almost all of the venous and capillary bleeding within from one to two minutes. Occasionally small veins are not controlled, only the smallest arteries are regularly controlled; rarely the larger arteries and veins are controlled. Particularly gratifying results were obtained in arresting bleeding from the dermis. The authors' experience has been favorable in 4 cases with traumatic wounds, 2 cases with bleeding from the appendical bed; and in 1 case at the time of resection of a pilonidal sinus. Hemorrhage was easily arrested in 16 plastic operations and in 22 cases the bleeding from ulcers and granulating surfaces was controlled. In some cases fibrinogen solution was flooded onto the wound after the application of thrombin and a tenacious clot was formed that arrested all bleeding. In 1 case excellent healing of a wound without suture or ligature was obtained by the use of thrombin, fibrinogen, and pressure in an approximated position.

The authors caution that thrombin is of little help in controlling active arterial bleeding and is even undesirable if one does not ligate arteries, since masses of clots are formed which obscure the operative field without controlling the hemorrhage. A combination of thrombin with soluble cellulose and a sulfonamide compound for packing traumatic wounds is recommended. No untoward reactions were observed in more than 75 applications.

PAUL W. SCHAFER, M.D.

Whitby, L. E. H.: The British Army Blood-Transfusion service. *J. Am. M. Ass.*, 1944, 124: 421.

The British Army differs from all other armies in that it has provided a distinct transfusion service with its own noncommercial source of supply of transfusion fluids and equipment, and with specially

trained distinct mobile resuscitation teams which can be attached to any appropriate medical unit overseas.

The Donor Registration and Publicity Department has a panel of approximately 350,000. This has to be maintained with continuous publicity. The collection of blood is carried out by 15 mobile self-contained fully equipped teams that go to the donors, who are called to a nearby convenient center. Each team carries the full equipment for converting any reasonably sized room into a miniature hospital ward in about twenty minutes. The blood obtained is transported in refrigerator trucks to headquarters. Distance prohibits a whole-blood service to the overseas forces from the home country, but an ample blood service is provided by base transfusion units in every theater of war. These units are equipped with refrigerator trucks, and blood is obtained from base-stationed troops. Only group O blood is supplied; the grouping is double checked and the Kahn test is done before the blood is dispatched. If the bottle is filled to the top to prevent spilling, the blood travels well. "Topping" is carried out with a special machine which sucks air out of the bottle and admits dextrose solution until the bottle is full. The track of the needle is self-sealing on withdrawal.

The majority of the blood taken by the home depot is processed to form plasma, which is either dried, for export to tropical countries, or supplied in fluid form for use in temperate climates. The main problem with plasma has been the making of a guaranteed sterile product which could be judged fit for use by its macroscopic appearance. Clarification and filtration is the obvious method. To eliminate clotting the asbestos filtration pad can be washed frequently with weak alkali to remove the retained prothrombin, or filtration can be done at such a *pH* that prothrombin cannot be activated. This fluid plasma must be kept cool but need not be refrigerated. Dried plasma is also made from filtered plasma; it is spun frozen in a standard transfusion bottle, and the water is sublimated from the frozen state. Each bottle exported is accompanied by the proper amount of pyrogen-free distilled water, also contained in a transfusion bottle, together with the apparatus for administration.

All transfusion fluids are accompanied by administration apparatus assembled at the home depot in tins sterilized for immediate use. In principle, all apparatus is standard whether it is to be used for blood, fluid plasma, dried plasma, or a crystalloid solution. Because of storage difficulties, the Army is given dried grouping serum in tubes, the equivalent of 1 cc. of the fluid, containing indicator silicagel. Group A and B serum are colored differently.

Regular courses of instruction for officers and other ranks are held in the training for the various specialties of a transfusion unit. In every theater of war there is a base-transfusion unit which is the link with the home unit, and in every corps there are a number of mobile field transfusion units serviced by the base unit.

The advantages of this separate transfusion service are that the personnel are highly skilled and the supplies are the special concern of particular units, which is important when perishable fluids are concerned. JOHN L. LINDQUIST, M.D.

Greaves, R. I. N.: The Production of Blood Derivatives to Meet War Requirements in Great Britain. *J. Am. M. Ass.*, 1944, 124: 76.

Stored whole blood has but a limited life and therefore cannot be made universally available. Liquid serum and plasma were both used successfully in the raids of 1940 and 1941 on England, but they were not ideal products. Many attempts have been made to produce a more stable liquid. Frozen liquid takes at least a half an hour to thaw and when the supplies are wanted in a hurry this is too long a waiting period; moreover, under war conditions all forms of heat may be cut off by bombing.

Although the liquid serum and plasma are unstable, in the dry form they appear to be completely stable and can be transported anywhere and stored in any climate and although liquid serum and plasma were extensively and successfully used for civilian casualties, because of their instability they were less satisfactorily used for the armed forces. The latter therefore had to have priority on the limited supplies of the dried product. However, the advantages of a really stable product were so great that further drying facilities were made available.

The author gives careful technical detail of how the bottles of serum and plasma are "spun frozen" so that the product freezes in a very small crystal size and thus permits rapid solution of the dried product, the solution time required being less than a half minute. The drying cycle takes three days and the work has been so designed as to require minimum personnel to do it. JOSEPH GASTER, M.D.

Co Tui, Bartter, F. C., Wright, A. M., and Holt, R. B.: Red-Cell Reinfusion and the Frequency of Plasma Donations. *J. Am. M. Ass.*, 1944, 124: 331.

The average donation of 500 cc. of blood entails the loss to the donor of approximately 75 gm. of hemoglobin and 17.5 gm. of plasma proteins, or a total of approximately 92.5 gm. of protein. The red cells as a rule are discarded, so that 80 per cent of the protein donated is wasted. If, however, the red cells are reinfused into the donor, then he is relieved of 80 per cent of this protein drain and from purely quantitative consideration should be able, theoretically, to donate plasma five times more frequently than is practiced at present. The authors set out to determine within what range this mathematical consideration holds true.

Of a group of 3 donors, 1 gave three and 2 gave four full-sized donations in one week, and a second group of 3 donors gave full-sized donations every week for from nine to twelve weeks. The donors received a reinfusion of their red blood cells after each donation. It was found that the total plasma

protein and hematocrit levels were normal within forty-eight hours after each reinfusion. The bilirubin level and reticulocyte count were normal throughout the course of this study in all of the donors.

The authors recommend that the practice of reinfusion of red cells into the donors be adopted when there is malnutrition in the donating population, also when a large proportion of the donors are women. EARL O. LATIMER, M.D.

RETICULOENDOTHELIAL SYSTEM

Davis, L. J.: Symptomatic Hemolytic Anemia; A Report of 4 Cases. *Edinburgh, M. J.*, 1944, 51: 70.

The term symptomatic hemolytic anemia embraces cases of acquired hemolytic anemia displaying an apparent etiological relationship to a certain morbid process such as carcinomatosis, lymphatic leucemia, or Hodgkin's disease.

The author reviews 4 cases showing the typical laboratory findings—a greatly lowered red-cell count with very low hemoglobin in each case.

Acceptance of the diagnosis of symptomatic hemolytic anemia in each case depends upon a reasonable basis for the conclusion that the anemic state results mainly from accelerated destruction of the red cells, which in turn is continued by the underlying morbid process. The necessity of a careful history is stressed; the diagnostic procedures such as sternal punctures are described; and interpretations of the findings are given. Treatment depends upon the underlying disease. PAUL MERRELL, M.D.

Gray, E. F.: Calcifications of the Spleen. *Am. J. Roentg.*, 1944, 51: 336.

One hundred and eleven unselected spleens were roentgenographed at autopsy. In most cases, it was possible to take roentgenographs of only half a spleen. Of the 111 spleens x-rayed, 63 showed evidence of calcification; 58 were of the miliary type; 5 showed calcification of the capsule; 5 showed involvement of the splenic artery and 1 revealed an infarct. Some spleens revealed more than one type of calcification.

The calcifications were equally divided between the males and females and occurred in any age groups; although in this series, as is to be expected, most of the lesions were found in the 4th to 8th decade groups. Eight cases showed evidence of systemic tuberculosis and 2 revealed liver calcifications, which were interpreted by the pathologist as being due to tuberculosis.

Calcifications of the spleen are usually multiple, small, and sometimes described as being of the miliary type. The etiology of splenic calcifications has not been definitely ascertained. Some authors attribute them to calcified venous thrombi; some to tuberculosis; and others to postinflammatory changes, malarial thrombosis, pentastomiasis, and bovine tuberculosis.

Other types of calcifications encountered in the spleen are calcifications of the splenic artery and intracapsular hemorrhage with subsequent calcification. Calcified hemangiomas and lymphangiomas, and calcified splenic capsules and infarcts have also been reported. Calcified nonparasitic cysts are found to be rare.

Calcifications were found in all regions of the spleen; their size varied from 1 to 8.25 mm. and they were oval or semilunar in shape.

Variations in the histological picture of calcifications as seen in the miliary type, and in the splenic artery, capsule, and infarct are discussed.

The author is of the opinion that the miliary calcification is dependent on a systemic tuberculosis. The changes in the capsule were thought to be due to degenerative changes. Involvement of the splenic artery represents an advanced stage of arteriosclerosis. Infarct calcification presents no problem roentgenologically, grossly, or microscopically. Several cases showing the different types of calcification are presented.

MAURICE D. SACHS, M.D.

SURGICAL TECHNIQUE

WAR SURGERY

Roddis, L. H.: Burns Incident to War. Measures for Their Prevention and for Treatment. *Mil. Surgeon*, 1944, 94: 65.

The incidence of burns in warfare is very great. In military organizations, burns are encountered on shipboard, in aircraft, and in vehicles used in mechanized warfare; in civilian organizations they occur in cities exposed to bombing and in war industries. Preventive measures against burns consist of protective plans and devices in the environment and those dealing with the individual.

On shipboard the plan of fighting fire calls for training in the use of fire-fighting equipment, the closing of water-tight doors, the shutting-off of the ventilation system, and the flooding of ammunition space. Preventive devices in ship construction are considered. For the individual, protection against the flash burn is important. Even a small amount of clothing protects from this instantaneous exposure. Because the flash finds its way up loose sleeves and trousers, the closer fitting underwear forms a better protection. Masks, gloves, and goggles are added protective measures, and now the possibility of nonconducting lotions and powders for the face and hands is being studied. Special clothing for fire-fighting has been devised. Diving and swimming under water is useful to avoid burning oil in sinkings.

Many protective devices against fire are used in the construction of aircraft. Flyers are trained to turn off ignition systems, change position, and abandon plane. The clothing, helmet, and goggles of an aviator are important protective features against burns. Incendiary and tracer bullets produce chemical burns, commonly from phosphorus and magnesium. It is against this type of weapon particularly that individual armor is worn.

The mechanized vehicle propelled by oil and carrying ammunition is a fire hazard second only to the plane. The use of nonconductors as lining and special fire-extinguishing apparatus are features of later tank construction. Instruction of personnel in the use of fire-preventing devices and in methods of escape from burning vehicles is important. Preventive measures for occupants of mechanized vehicles are protective clothing, helmets, and gloves, and instruction in the prevention of inhalation burns.

Military protection of cities exposed to bombing must be supplemented by the organization of the civilian population. Casualties should be distributed among the medical facilities available. The hospitals must be organized into teams with specific duties, which the author outlines. The protection offered by air raid shelters is obvious. Instruction of the civilian population in the best means of avoiding injuries of all kinds is a part of any program to enable the individual to protect himself against burns.

Conditions resulting from war tend to increase the total number of accidents, including burns, in various industries. Federal, state, and industrial services have been organized to combat these conditions. Preventive work includes such features as preventive devices on machinery, educational programs, and research to discover safer methods of operation. Individual measures are concerned with protective clothes, masks, goggles, gloves, and other protective devices, and adherence to accident-prevention instructions.

The following instructions on the treatment of burns in the first twenty-four hours are based on recommendations made by the Subcommittee on Burns of the Committee on Surgery of the National Research Council:

A. Primary objectives: (1) to protect the burned area, which is an open wound, from further contamination; (2) to prevent and combat shock as promptly as possible by plasma transfusion, if available; (3) to relieve pain, and (4) to minimize fluid loss.

B. Asepsis. The medical officer and assistants should be masked; otherwise mouths should be kept closed as much as possible.

C. Chemotherapy. Four grams of sulfadiazine should be given by mouth.

D. Plasma. Administer plasma promptly, if available, or the equivalent number of units of human serum albumin. (The army and navy have standardized packages of 25 gm. of serum albumin dissolved in 100 cc. of buffered diluent, the equivalent of 500 cc. of citrated plasma.)

E. Morphine. One-half grain of morphine should be given. If lung damage or pronounced anoxia is present, the dose should be limited to ¼ gr.

F. Burned Areas. Rings should be removed from fingers of burned hands; boric-acid ointment applied over the burned surface, or, if this is not available, vaseline should be used. One or two layers of sterile fine-mesh gauze is placed smoothly over the ointment-covered burn. Over this a smooth thick layer of sterile gauze dressing is placed and a gauze or muslin bandage is firmly arranged over the dressing. If an extremity is burned, a splint is advised.

G. Prophylaxis against tetanus and gas-bacillus infection. An intramuscular injection of ½ cc. of tetanus toxoid is given to patients with second- and third-degree burns, provided they have received initial immunization. The prophylactic dose of gas-bacillus antitoxin may be given at the discretion of the medical officer.

H. Eyes. An instillation of 2 per cent butyn ophthalmic ointment may be given for burns of the eyeball. The patient must be cautioned against rubbing his eyes. Particles of lime or chemicals should be removed mechanically or by washing the eyes in boric-acid solution.

Other methods of treatment which have been used are as follows:

Burns of all surfaces, except those of the hands, feet, perineum, and genitalia, and those involving the circumferences of an extremity, may be treated with the well known tannic acid and silver nitrate.

Physiological saline solution has been found useful in the treatment of burns involving the face, feet, hands, and, especially, the fingers; also in the treatment of burns involving the genital flexures and perineum.

The use of the sulfonamides as a local application to burns has been common. Sulfanilamide in mineral oil was one of the most popular methods. The author believes that infection is more readily prevented by the administration of the sulfonamides by mouth or into the veins than by local application to the burned area.

Oil, grease, and dirt should be gently removed with solvents (lard, glyceryl monoleate, or "ninol"), which is to be followed by washing with detergents (mild soap and water, "orvus" [5 per cent solution], or "ninol" [2 per cent solution]. No débridement of burns, rupture of blebs, nor removal of injured tissue should be done.

In severe and fatal burns of the respiratory tract the symptoms of dyspnea, cyanosis, and coma rapidly appear, and death usually occurs early. In less severe cases symptoms may not appear for several hours. The treatment consists of rest, oxygen administration, and the moderate use of morphine. When the burn and resulting edema has not passed the larynx, tracheotomy may save life. Widespread bronchitis and pneumonia is seen after twenty-four hours.

As a result of research on the treatment of burns, two important discoveries have been made. The first of these—the relation between environmental temperature and mortality—has shown that the mortality of experimental animals suffering from severe burns was least at about 75° F., and most at 99° F. and from 32° to 55° F. The use of air-conditioned wards and rooms may be important measures in the future. The second experimental study has demonstrated that there is a substance in liver which is effective in preventing shock due to burns. If adequate amounts of penicillin become available, future research will probably deal with this agent.

ERNEST E. ARNHEIM, M.D.

MacLennan, J. D.: Anaerobic Infections in Tripolitania and Tunisia. *Lancet*, Lond., 1944, 246: 203.

Cultures of battle wounds in the African theater of war indicated an incidence of contamination by anaerobic organisms of from 45 to 55 per cent. The proteolytic varieties of clostridia were found in 69 per cent of these cultures. Anaerobic cellulitis occurred in 7 of every 1,000 wounds, and developed late (about thirty-six hours after injury), usually as the result of inefficient treatment. Anaerobic cellulitis must be distinguished from gas gangrene, and is best treated by débridement of the dead or dying tissue. The wound should be left wide open, and the part immobilized.

Gas gangrene was found in 44 casualties, an incidence of 7 in every 1,000 wounded. The average incubation period was one and six-tenths days. Sixty-five per cent of the patients had severe trauma to the femoral artery and of these, 5 died. In only 2 cases was there evidence of any relationship between the development of gas gangrene and the duration of tourniquet application. In the vast majority of patients (71 per cent), gas gangrene appeared in wounds of the buttocks, thighs, or legs. Gas was never a prominent feature in true gas gangrene until late in the disease. Profound shock and toxemia, and pain and swelling were the most constant features. The sudden or unexplained onset, or increase, of pain in an infected wound should be regarded as a warning signal of gas infection. The recovery rate from gas gangrene was 70 per cent, and this high rate of recovery is attributed to good surgery and intensive serotherapy.

Amputation was not done in cases in which only a single muscle or group of muscles was involved.

The author is opposed to the use of massive doses of sulfonamides and states that he has obtained equally good results with the use of smaller doses. In toxic cases the sulfonamides should be given intravenously. The average amount of gas antitoxin given was 100,000 international units, which was given either intramuscularly or in combination with blood, glucose, and saline solution.

Among 13 fatal cases, 8 deaths may be attributed to inadequate serotherapy. The minimum initial therapeutic dose of antitoxin should contain 49,500 international units. The author recommends that the manufacturers of gas antitoxin increase the titer of clostridium oedematiens because in his experience this organism seemed to be the most toxic agent.

The factors associated with the development of gas-gangrene shock were the profuse serous leakage of the wound, the intravascular hemolysis, and the toxemia of overwhelming infection. In the treatment blood proved to be superior to plasma or serum. In a few cases plasma, for some unexplained reason, was more beneficial than blood. Anaerobic streptococcal myositis must be differentiated from gas gangrene. It occurred in 7 patients with only 2 recoveries. It was never found at the forward echelon.

BENJAMIN G. P. SHAFIROFF, M.D.

Adolph, P. E.: Preoperative Measures Used in War Surgery in China, with Special Reference to the Delimiting Tourniquet. *Ann. Surg.*, 1944, 119: 246.

Adolph discusses the preoperative measures which were used for casualties in the early part of the Sino-Japanese War (January, 1938, to January, 1941). The casualties were treated in four North China hospitals on both sides of the fighting lines, and were first seen two or three days after wounding. The preoperative preparations varied according to the

time which had elapsed after injury and the circumstances under which the work was done.

Treatment for shock. Because of the lack of blood and plasma supplies, only the most exsanguinated patients received transfusions. Exhaustion, malnourishment, and fever were general, the wounded having been carried 140 miles during eight days by litter bearers, over rugged mountain passes. There had been no immobilization of the wounded parts, nor any dressings en route. The wounds were almost all badly infected and many were infested with maggots.

A few patients were operated on immediately. The results were disastrous. Exhaustion and malnutrition had prepared them for the worse postoperative shock and stormy convalescence.

The rest were kept in the ward for a week or more before operation. Improvement was remarkable. A comfortable bed, congenial surroundings, immobilization of the wounded part by the simplest means, sulfanilamide by mouth, vitamins, and good nourishing food resulted in a smooth operative and convalescent course.

Malnutrition. Considerable inanition was seen among troops who, at best, were getting along on inadequate diets. Particularly was this true of the Chinese Communist Troops who practiced extreme Marxism, with its share-alike principles applied equally to civilians and military personnel, which resulted disastrously in view of prevalent conditions bordering on famine. When these men became wounded, the problem seemed to be primarily one of hypoproteinemia and avitaminosis. Feeding them good nourishing food, rich in protein, and in more extreme cases the administration of ascorbic acid parenterally seemed to play a big role in preoperative preparation and recovery.

Infection. Sulfanilamide tablets were unavailable until January, 1938, from which time until January, 1941, only small consignments of sulfanilamide and sulfapyridine were obtainable. Sulfonamide powder was not used locally becausc it was unavailable in sufficient quantity. Hence, infection was inevitable, particularly because the wounds were seen late. Preoperative measures always included a saturation of the body tissues with sulfonamide given orally, which decidedly cut down the amount of postoperative infection.

Intercurrent diseases. In the face of trauma and exhaustion, latent diseases tended to develop into frank clinical cases. Accordingly, in a case with rise in temperature, quinine or the like was often needed equally as much as sulfonamides.

Toxemia. In some cases, toxemia complicated malnutrition and infection. The delimiting tourniquet, a gum-rubber tubing tourniquet, was applied effectively to prevent absorption of toxic products from the severely septic and/or gangrenous extremity which would later require amputation. Gangrene and infection elaborate toxins by reason of tissue disintegration and bacterial growth. The resulting toxemia produces disturbed body metabolism. Should toxemia become severe enough, a comatose stage is reached, which, if the toxemia continues unabated, eventually becomes irreversible and fatal. This was prevented by applying the tourniquet when coma became apparent and resulted in dramatic restoration of normal body metabolism.

The principal indications for the delimiting tourniquet are (1) when there is the need of preoperative improvement before the patient is subjected to amputation; and (2) when there is the inevitable delay in getting the severely toxemic casualty, who may have been lying on the battlefield for two or three days, to a hospital. The tourniquet is applied distal to the anticipated level of amputation but sufficiently proximal to the diseased part that it is well above any area of infection.

Precautions in the use of the delimiting tourniquet.

1. It is necessary to see that the tourniquet is not released until amputation is performed. This is important as directives referrable to the care of patients call for intermittent release of the tourniquet when it is applied for the control of hemorrhage. Hence, the tourniquet should be extensively covered with adhesive tape, appropriately labelled, and an indication made that it is not to be removed.

2. The delimiting tourniquet should be reapplied every twenty-four hours at a slightly higher level each time until amputation is performed so as to avoid contact of normal tissue with toxic fluids produced by the pressure necrosis at the point of application of the tourniquet.

In reapplication of the tourniquet the old tourniquet is left in place until the new one has been applied proximal to it. Morphine should be administered before the tourniquet is applied.

Conservative treatment for gas gangrene. Gas gangrene gave disappointing results in the earlier cases when immediate amputation was done. The use of conservative measures with delayed amputation, or no amputation at all, seemed to produce the best results.

Sulfanilamide was administered intravenously the first day in the serious cases, after which it was given orally. This therapy was justified, largely on the basis that the sulfonamide counteracts the symbiosis of streptococci with gas-gangrene bacilli.

STEPHEN A. ZIEMAN, M.D.

Buxton, D.: Surgical Experiences in the Middle East from 1941 to July, 1942. *Brit. J. Surg.*, 1943, 31: 111.

This article presents in detail the picture of surgical conditions in the Middle East during 1941 and 1942.

The first part deals with the prevalent conditions of the hospitals, the transport of personnel, and other main features pertaining to the medical service in the field.

The second part deals with the general principles of treatment of gunshot wounds of bones and joints, both in forward areas and at base hospitals.

CONRAD L. PIRANI, M.D.

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Lamont, E. S.: Plastic Surgery in Facial Paralysis with Modifications in Technique. *Arch. Otolar.*, Chic., 1944, 39: 155.

The type of operation that is selected for facial paralysis should depend on the clinical findings. If the lesion is central, obviously the choice will be limited; if it is peripheral, the following operation or combination of operations may be attempted: decompression, suturing of the nerve, anastomosis, nerve grafting, cervical sympathectomy, or reconstructive surgery.

It requires from six months to a year to obtain full use of the innervation that can be obtained by anastomosis or nerve graft, and a much longer period to learn to use it to the greatest advantage.

A technique of reconstruction for facial paralysis is presented. This combines a fascial transplant with the temporal muscle with an adjustment of the relaxed tissues of the face.

Beginning at the temporal region, the Blair needle is encased beneath the superficial portion of the deep fascia and run in an arc downward to the upper lip, piercing the skin through an incision nicked just lateral to the farthest edge of the philtrum at a point immediately below the columella. The assistant then feeds one end of a fascial strip to the harpoon hook of the Blair needle, and the surgeon retracts the latter, bringing the fascia out at the temporal region. The Blair needle is then entered through a nick incision in the skin of the lip ½ inch below the first incision, and the fascia is woven through to come out at this lower point. The needle is again passed down from the temporal region, coming out through the lower incision on the lip, and the fascia is grasped in its hook and retracted. The lower end of the fascia is woven into the interstices of the temporal muscle, then securely tied to the upper end and locked with a silk stitch.

A similar procedure is carried out on the lower lip, the fascial sling passing from the temporal region to the upper aspect of the lower lip, down toward the symphysis of the mandible, then back to the temporal region. If necessary, a shorter sling may be passed to the corner of the mouth on the affected side. In all of these procedures the surgeon must be careful to overcorrect the deformity.

The section of skin previously outlined on the face for excision is now removed. All bleeding or oozing has been meticulously controlled. Sulfanilamide crystals are sprinkled within the whole wound just before closure. The face flap is supported by a purse-string suture and approximated by a subcuticular silk suture, and the edges are sewn with fine black silk.

HAROLD C. OCHSNER, M.D.

Maltz, M.: Reconstruction of the Nasal Tip. A New Technique. *Am. J. Surg.*, 1944, 58: 203.

After reviewing briefly the history of rhinoplasty, Maltz presents a method for the replacement of skin lost from the extreme tip of the nose. Although the skin of the neck and forehead is suitable from the standpoint of texture and color, grafts taken from these areas produce too much visible scarring for the small amount of tissue required. To overcome these factors, the skin from the dorsum of the hand directly behind the angle formed by the index finger and the thumb is selected. Because this area is usually exposed to atmospheric conditions, the color closely corresponds to that of the nasal tip.

The technique, in which a small cylinder of skin is made with the raw surface outward and attached to the proper area on the nose, is described. The graft remains in place from two to three weeks, after which it is detached from the hand. Immobilization is by means of a plaster-of-Paris cast holding the head, hand, forearm, arm, and chest.

The author points out that free grafts to the nasal tip are hazardous and cannot approach the certainty of a pedicled graft. He believes that this direct method has not been employed previously.

BENJAMIN GOLDMAN, M. D.

Mulholland, J. H., Tui, C., Wright, A. M., Vinci, V., and Shafiroff, B.: Protein Metabolism and Bed Sores. *Ann. Surg.*, 1943, 118: 1015.

Through the literature on bed sores there runs the implication that malnutrition contributes somewhat to the development of bed sores.

The authors' interest was aroused by the development of a bed sore in a patient with third-degree burns, whose total plasma proteins amounted to 5.4 gm. per cent. This occurrence suggested a possible relationship between hypoproteinemia and the development of bed sores. Accordingly, total plasma-protein determinations were taken in 35 random cases of bed sores. Analysis of the results showed that 29 of the cases had plasma protein levels below 6.0 gm. per cent, and that the extent of depth of the ulcers as well as their multiplicity seemed to be related to the level of the plasma proteins.

Eight patients were submitted to careful study. Two patients were placed on a high caloric but low nitrogen diet for the first six days. The other 6 patients had a control period for the first three days during which the usual ward diets were given. After these control periods, the patients were given an amino-acid dextrose diet (mixture) in physiological saline solution. During the entire hospitalization period the patients had been receiving daily adequate supplementary vitamin therapy.

Experimental results were uniform in that all patients with ulcers showed initial signs of healing on the fourth day after institution of the therapy with the amino-acid dextrose mixture.

The ulcers failed to heal with the high caloric, low nitrogen diet for six days in the 2 cases. The occurrence of signs of healing on the fourth day after the nitrogen balance was made positive showed that it was not the high caloric intake which initiated healing. The use of a mixture which contained no fat indicated that fatty acids are not essential in the

healing of these sores. The narrow ranges in which the hematocrit changed indicated the lack of direct relationship between anemia and the development of bed sores. The vitamin therapy that the patients received prior even to the development of the bed sores showed that in the presence of hypoproteinemia, vitamins do not prevent the development of bed sores. Finally, the prompt healing becoming evident four days after the reversal of the nitrogen balance, from negative to positive, points to a definite relationship between protein metabolism and the development of decubitus ulcers.

In patients with hypoproteinemia the tissues are so changed that it apparently takes a smaller amount of pressure, or the same amount of pressure for a shorter amount of time, to cause tissue necrosis. The theory is advanced that both local pressure and a tissue of impaired vitality, as a result of protein deficiency, are factors in the causation of bed sores.

JOSEPH GASTER, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

McGrath, E. J.: Wounds of the Chest. *J. Am. M. Ass.*, 1944, 124: 488.

Contusions producing fractures of the ribs constitute the most common type of nonpenetrating wounds of the chest; such injuries, however, are more properly considered within the sphere of fractures. Another type is the open wound of the chest wall which does not penetrate the parietal pleura. Such a wound may be produced by a cutting or stabbing instrument which has been deflected by the ribs or sternum, spending its force by dissection along the tissue planes of the thoracic cage but not penetrating the parietal pleura. The treatment of these wounds is similar to that of wounds in other locations except that complete excision is rarely advisable.

Penetration of the pleural cavity with consequent disturbance of the mechanics of respiration and circulation distinguishes thoracic wounds from those in other portions of the body. Such aberrations in these life-sustaining physiological mechanisms do not allow much margin of safety and demand of the physician a thorough understanding and appreciation of the normal physiology and of the disturbances resulting from disruption of these mechanisms. Therapeutically, such wounds require prompt attention and, not infrequently, delicately balanced judgment. The least complicated type of penetrating chest wound is that in which the perforating weapon is small, passes through the thoracic wall with minimal trauma, and opens the parietal pleura without injury to the underlying visceral pleura. Treatment consists of shock therapy, immobilization of the involved hemithorax (particularly at the base), and bed rest in high Fowler's position for from five to ten days. The patient is watched carefully during the first twenty-four hours for complications. When, in addition, pneumothorax is present, the resulting lung collapse and mediastinal shift cause a greater disturbance of the cardiorespiratory physiology. Treatment of such wounds consists in immediate closure of the opening in the chest wall with whatever is available, followed by the treatment of shock. The patient is not transported before shock is controlled. When more complete treatment can be carried out, the wound is cleansed, the pleural cavity is aspirated to increase available pulmonary capacity, sulfonamides are given, and the defect in the chest wall is closed. If the pleural cavity has been sufficiently contaminated, closed drainage with a catheter is advised. Continuation of anti-shock measures is urged during and after the operation.

If tension pneumothorax occurs, the decompression must be done promptly to relieve respiratory and circulatory distress or the patient will die. The decompression is accomplished through needle or catheter aspiration connected with a tube which discharges the pleural air under water. Bleeding from the chest wall is uncommon and frequently may be due instead to pericardial or intramediastinal damage. Hemothorax resultant from such injuries is preferably treated conservatively if the lung is gradually re-expanding. Even otherwise decompression should be done very gradually. When there is extensive lung damage, the prognosis usually is poor. Both at operation and at autopsy there frequently is massive hemothorax as well as gross dissecting interstitial pulmonary hemorrhage. Since conservative therapy has yielded such poor results, operation is advised. The measures to be employed in these injuries vary with the extent and severity of the condition encountered and include such procedures as simple pneumoplexy, exteriorization of the injured portion of the lung, partial or complete lobectomy, or, if necessary, pneumonectomy. Penetrating thoracic wounds communicating with the peritoneal cavity require exploration of both cavities; the abdomen is explored first and thereafter an open thoracotomy, cleansing of the pleural surfaces thoroughly by repeated saline irrigations, and closing with catheter drainage after prophylactic instillation of sulfanilamide are done. If the mediastinum is penetrated and cardiac tamponade ensues, then the heart wound must be closed and the blood clot from the pericardium thoroughly evacuated. Loose closure of the pericardium will permit decompression of the effusion which invariably follows such operative intervention. Mortality from wounds of the heart in the hands of experienced clinicians is about 23 per cent.

EDWIN J. PULASKI, M.D.

Zinninger, M. M.: Penetrating Wounds of the Abdomen. *J. Am. M. Ass.*, 1944, 124: 491.

Patients with penetrating wounds of the abdomen should be examined first for shock; second for the nature, extent, and evidence as to direction of the wound; and third for signs of peritoneal irritation. Local exploration is not advised, except under anesthesia, for probing may spread infection and lead to erroneous conclusions regarding depth and penetra-

tion of the wound. If shock is present, it should be the first thing treated, and since shock is frequently the result of intra-abdominal hemorrhage, whole-blood transfusions are indicated. Preoperatively it is worth while to examine patients with retained foreign bodies with the fluoroscope. By seeing the bullet and knowing its relationship to the wound of entrance one can often get a fairly good idea of what intra-abdominal structures may have been traversed. For anesthesia, the intratracheal administration of cyclopropane or of ether is preferred. Aspiration of the stomach before operation is not recommended.

The high mortality attending penetrating wounds of the abdomen is due principally to hemorrhage and to peritonitis from perforation of the hollow viscera. The most severe bleeding results from perforation of the large blood vessels and of the kidney and spleen. Infection results mainly from gross spilling of the gastrointestinal contents from visceral perforations, and occasionally from foreign material being carried into the wound. Material from the lower ileum and colon may cause severe contamination.

When a penetrating abdominal injury occurs, a sterile dressing is applied as soon as possible to the open wound and shock treatment is begun. This includes the administration of plasma until typed and cross-matched blood is available. Antitetanic serum is administered, and the patient is examined for signs of peritoneal irritation. If there is any doubt about perforation, it is safer to make an exploratory laparotomy than to explore the wound locally or to await the development of untoward symptoms. If the wound is large and associated with lacerated tissues, it should be débrided and extended to allow access to the peritoneal cavity. If it is small, it is disregarded or débrided locally, and a standard abdominal exploratory incision is used. When the peritoneal cavity is opened and reveals extensive hemorrhage, the first and most important step is to find the bleeding point and stop the loss of blood. In other instances, the control of the spilling of gastrointestinal contents is most important, and a systematic inspection is essential. Perforations are most likely to be overlooked on the posterior wall of the stomach, in the duodenum, and at the junction of the small bowel with its mesentery (where the perforation may be obscured by a hematoma). Closure of the perforations is done with mattress sutures of fine silk with the suture line at right angles to the long axis of the bowel. When the bowel is badly torn it is resected between Kocher clamps and an end-to-end anastomosis is done. It is wise to invert brush burns and bruises, for such areas may undergo gangrene and perforate later if this is not done.

In wounds involving the lower part of the abdomen, special attention needs to be paid to possible perforation of the bladder or section of the ureter. If there is one hole in the bladder there is usually a second one which may be hidden extraperitoneally. Wounds in the bladder need to be sutured and a retention catheter then placed in the bladder after the operation is concluded. If a ureter is partially or completely severed, it may be anastomosed or the proximal end may be implanted into the bladder and the distal end tied off.

Wounds involving the spleen usually require splenectomy. Wounds of the kidney occasionally demand nephrectomy, but this should be done only in case of almost complete destruction of the kidney or uncontrollable hemorrhage. As a rule the bleeding can be controlled by suture or packing. Nephrostomy may be necessary if the pelvis is badly damaged. Wounds of the liver, if small, require no treatment. In larger wounds, suture may be used to control bleeding. If the wound is quite large, it may be necessary to resort to a pack, which is brought out as a drain. Rarely the gall bladder is injured and must be removed.

After seeing that all wounds of the hollow viscera are closed and that major bleeding is controlled, foreign bodies, such a bits of clothing, or gun wadding, must be removed. The liquid contents of the stomach or bowel are removed as completely as possible with an aspirator. As a rule, no drains are placed into the peritoneal cavity unless a pack or drain is necessary to control bleeding or unless the pancreas has been injured or the retroperitoneal space is contaminated. If possible, drains are brought out through a separate incision, often in the flank.

Before the abdomen is closed, sulfanilamide is dusted into the peritoneal cavity, 5 gm. or more being used, up to a maximum of about 8 or 10. As a rule, no sulfonamide drug is placed in the laparotomy wound itself, as this has proved of little or no value in improving the results or in reducing the incidence of complications. At the Cincinnati General Hospital the wound is closed with through-and-through silver or steel wire sutures which allows a very rapid closure even with considerable tension.

After operation a tube is passed into the stomach for continuous gastric suction. In patients progressing satisfactorily it is usually removed at the end of from forty-eight to seventy-two hours, and liquids are then started in small amounts by mouth. Prior to this time all fluid and food are given parenterally as dextrose solution, amino acid, blood, or blood plasma, which is given intravenously. In most cases sulfadiazine is given either intravenously or subcutaneously during this same period, and the blood levels are determined every other day. Complications have to be treated as they develop, the most common being pulmonary atelectasis, pneumonia, wound infection, peritonitis, and intra-abdominal abscess. EDWIN J. PULASKI, M.D.

Fleet, G. A., and Ackman, F. D.: Immobilization and Infrequent Dressings in the Treatment of Wounds and Infections. *Canad. M. Ass. J.*, 1944, 50: 109.

The workers at the Montreal General Hospital adopted the closed plaster method in the treatment

of compound fractures and were so pleased with the results that they were encouraged to apply the same procedure to aid in the cure of osteomyelitis. During the last few years they found a variety of conditions in which this method was used to advantage and the field is slowly but surely enlarging. The material and experience upon which this article is based have been taken from the surgical wards of the Hospital, where interest in the technique advocated has been continuous. A very large number of cases of all kinds have been so treated, including all varieties of fresh trauma, burns, and infections of all kinds, both aerobic and anaerobic.

Rest, the fundamental principle of therapy, takes precedence over all other factors. It is, moreover, universally understood and accepted. All the other factors will be found to be subordinate to rest in one way or another. There is ample confirmation of the exclusion of pathogenic bacteria from wounds by occlusive dressings. This is exemplified by the "closed plaster" treatment and by the "pressure dressings" as used in burn treatment and plastic surgery. The fact that excessive contamination of wounds by pathogens is the price of frequent change of dressing is also well established. In this connection, the work of Hare, Trueta and Barnes, Orr-Ewing, Scott, and Gardner is outstanding. The localizing effect on infection of "infrequent occlusive dressings" and, in particular, of "closed plaster," in so far as the vascular circulation is concerned, has been described by Trueta as an active congestion of local tissues under the dressing, in many respects simulating the inflammation phenomena.

To the authors, the matter seems more easily understood if pressure is regarded as a means of preventing the accumulation of interstitial fluid and, thus, improving the circulation through the affected part. The lymphostatic effect of rest alone has been well demonstrated by Field, White, and Drinker. In addition, it should be recalled that bacterial dissemination from an infection takes place via the lymphatics rather than via the blood stream. Pawlowsky (1900) was convinced of this, and Drinker *et al* have proved it by revealing the autogenous retention within the dressing of antibacterial and other beneficent products of the body's immunological armamentarium in the exuded serum. Very little has been made of this point although its importance may, perhaps, be assumed from the healing in the peritoneal cavity without drainage, or with at best only partial drainage, in diffuse peritonitis. Many attempts have been made, however, to aid the local natural defensive mechanism of the body by chemotherapy. Such compounds as "Bipp," "Zipp," "Zisp," the aniline dyes, particularly proflavine, and other materials have all been used, and some with considerable success. More recently sulfonamides have been employed in this role. This local use of sulfonamides has been widely developed, and they have been combined with other bacteriostatic agents and placed in various vehicles. Whether in fresh trauma or in preinfected cases, the role of packing gauze in the wound in providing adequate drainage is generally accepted. When paraffin or vaseline is impregnated in the gauze, the usefulness of the drain is increased. The latter fact has been emphasized by several writers, notably Gurd and McKim, who described it as "curtain drainage." More recently, in 1941, the use of this type of drainage has been urged by Pfeiffer and Smith. It should be stated categorically that in compound fractures and in larger wounds, the failure to carry out adequate surgical excision of dead and devitalized tissue, to enlarge the wound, and to relieve fascial tension nullifies all of the foregoing benefits of occlusive infrequent dressings. Experience of all those familiar with this method of surgical treatment has shown that the degree of success obtained depends upon certain essential factors, notably:

1. *Timing of each step in procedure.* All other factors are subordinate to this from the first to last. For example, the fallacy of attempting surgical operation in fresh trauma before shock and hemorrhage is controlled should be emphasized. On the other hand, if operation be delayed too long the risk of infection is enhanced. Hence, the "safe period" is the essence of "timing." An illustration of this is the success of relatively early skin grafting in burns, in the third or fourth week before granulation becomes excessive and the patient's general condition deteriorates.

2. *Efficient first-aid in emergency cases.* (a) Control of hemorrhage. When a tourniquet is required it is imperative that it be inspected by a doctor within half an hour. (See Blalock's recent publication for elaboration.) (b) Prevention of contamination by early application of a large, sterile-gauze, dry dressing. This dressing should rarely be interfered with until the case has reached the surgeon who is prepared to treat it. Application of a sulfonamide in powder or suspension form may be carried out to advantage before the dressing is applied. (c) Minimization of shock by alleviation of pain, protection from the elements, and gentleness in handling the patient. (d) Splinting of cases when necessary with due regard to the nature of the injury and due respect for the circulation of the part.

3. *Control of shock and hemorrhage.* This should be done in so far as it is possible before definitive surgical treatment is begun.

4. *Adequate surgery adapted to the individual case.* (a) In fresh trauma this means enlargement, exploration, and thorough wound excision. Evidence exists that when this is done within six hours of injury there is minimal risk of wound infection. Under special circumstances a period considerably longer than six hours may safely intervene between the inspection of the wound and operative care. Such conditions may include, among others, wounds received on shipboard, on clean sandy beaches, and in manufacturing plants where infective material is absent. It is believed that early adequate application of sulfonamides, or perhaps their oral administration, prolongs the "safe period" substantially.

(b) In all cases, including infections, this treatment implies provision for adequate wound drainage by the insertion of a snug pack of paraffin-impregnated gauze. There is ample evidence to show that when the pack is impregnated with an oily material such as liquid paraffin or vaseline, the drainage effect becomes more efficient.

5. *Immobilization of the part.* With plaster-of-Paris, starch bandages, and pressure dressings. In the authors' experience it does not matter that "closed plaster" dressings be unpadded with this technique. On the contrary, they have found that a bulky dressing or padding under the plaster may be advantageous, provided the latter is applied with moderate pressure and especially if the bulky dressing is made semi-elastic as with cotton waste. This dressing absorbs considerable exudate and continuous pressure is maintained throughout.

6. *Timing of dressing change.* The timing of the change of dressing is most important. It will depend upon a number of things. Fundamentally, it should be as infrequent as possible. In explanation of this statement one must consider all the reasons for the ordinary change of dressing. They may be as follows: (a) because of healing that has already taken place—as in superficial burns after six or seven days; (b) because healing has taken place and prolongation of fixation may cause delay of functional recovery, as in tendon sutures; (c) because prolonged fixation is conducive to healing as in fractures; (d) because exudate or hemorrhage is excessive and wound toilet is indicated, as in large trauma; (e) because bacteriostasis is exhausted by excessive slough, necrosis, or exudate, and renewal of the bacteriostatic agent is required, as in large infected areas or abscesses.

The inhibitory effect of necrotic tissue and exudate on the bacteriostatic action of sulfonamides has been emphasized by such workers as Holderant, MacKay, and Strakosch and Clark. These workers have demonstrated that when urea (carbamide) is added to the sulfonamides, it effects some increase in the rate of necrosis or sloughing time. This in turn prolongs the bacteriostatic effectiveness of the sulfonamide. Urea would thus appear to be a useful adjunct in extensive sloughing wounds. However, it must be recalled that it does inhibit epithelization, and also causes overgrowth of granulation tissue. Therefore, its use should be discontinued once the slough has separated. The authors have had no personal experience with the use of urea in their dressings.

The emergent indication to remove a cast is continuous throbbing pain; this demands investigation especially if it is associated with an increased temperature. In every single instance persistent pain and fever will be traced to failure of the human factor in either diagnosis or surgical technique, and not to the principle of occlusive dressing. Edema of the portion of the extremity beyond the plaster, which persists after elevation of the limb, suggests circulatory trouble. This complication has fortunately been seen very rarely in the authors' cases; apart from the human factor, it may represent secondary hemorrhage or another unforeseen vascular incident. Loosening of the cast may result from atrophy of the muscles or inadequate and improper padding. Inadequate immobilization, such as failure to incorporate nearby joints, may cause any or all of the aforementioned conditions. This point needs all possible emphasis. There is no such thing as a time limit in this treatment. In the absence of complications, casts have been retained for as long as three months. The average time for a change of cast is from three to four weeks. Offensive odor may occur, especially in cases involving the lower extremity. A two-layered stockinette "sheath" filled with charcoal and drawn over the plaster has proved satisfactory.

The advantages include comfort of the patient, saving of material and time of the staff, and more rapid healing. JOHN E. KIRKPATRICK, M.D.

Douglas, B.: The Treatment of Burns and Other Extensive Wounds, With Special Emphasis on the Transparent Jacket System. *Surgery*, 1944, 15: 96.

The manifestations of primary or nervous shock are noted in burns in which large skin areas of the body surface are involved (measured by the method of Berkow). In addition to the extent of the burn, other factors in prognosis are the depth of the burn, the age and condition of the patient, and the quality of the treatment.

Much experimental work supports the theory that a specific toxin is formed in burned tissue and is absorbed into the blood stream.

The significant change in blood circulation in severe burns is hemoconcentration associated with the loss of fluid into the tissues. A résumé of the changes in blood chemistry secondary to burns is presented.

Three stages may be recognized in the course of patients with extensive burns. The first stage (primary shock) begins immediately and lasts, in patients who recover, from six to twenty-four hours. The second stage (toxemia) lasts from twenty-four hours to twelve days. In addition to blood concentration, infection may supervene, and the toxemia of the infection may be added to the already existent toxemia. The third stage (repair) covers the time from which toxemia has subsided to complete healing. Intercurrent disease and complications may occur in this stage.

In the treatment of burns, attention should be directed to the patient's general condition as well as to local treatment. Small burns are satisfactorily treated with sterile bland ointments, but in the case of small deep burns with resulting black slough immediate débridement of the slough should be performed, followed by dakinization and grafting.

The treatment of extensive burns should be considered as an emergency demanding immediate attention. First-aid measures are outlined. In consideration of systemic treatment, the importance of the administration of fluids (glucose, plasma, or

whole blood) is emphasized. Other measures discussed are the administration of adrenocortical extract, oxygen, sulfonamides, and a high caloric diet.

The principles underlying the local treatment of extensive burns are: (1) protection and rest for the damaged part, (2) obliteration of capillary exchange at the site of injury, and (3) antisepsis. The means of carrying out principle 1 are concerned with the problems of cleansing and débridement; principle 2, with the problems of mechanical pressure, surface coagulation, and the use of vasoconstrictor drugs. The chief factor in principle 3 is the provision of a suitable covering. In this connection, the subject of transparent jackets in the treatment of burns and other wounds is discussed in detail.

The evolution of the transparent-jacket method is based upon original work by the author since he was the first to treat a patient by this method in 1935. By the use of transparent jackets it is possible to maintain strict asepsis, efficient covering which requires change infrequently, and a certain amount of mechanical pressure on the part. The wound is sealed from the outside except for drainage and irrigation through controlled orifices. The jackets are of definite value in preparing the surface for early grafting and for applying regulated pressure to grafts and the tissues underlving them.

The latest jackets, illustrated in Fig. 2, are made of a glass plastic cloth, krestex. They are made in different sizes for various parts of the body, have airtight and watertight seams, and are provided with openings for irrigation tubes which may be introduced or built in. Rules for the application of the jackets are outlined.

For purposes of applving constant or intermittent pressure to skin-grafted surfaces on the extremities, semirigid transparent jackets made of cellulose acetate have been developed (Fig. 1). The means of applying pressure to skin grafts within the jackets are described.

A few typical cases which serve to illustrate the development and use of the transparent jackets are reported in detail. ERNEST E. ARNHEIM, M.D.

Bodenham, D. C.: Infected Burns and Surface Wounds; the Value of Penicillin. *Lancet*, Lond., 1943, 245: 725.

This article is based on a large number of cases of deep burns and surface wounds with complete destruction or loss of skin, 75 of which were treated with penicillin.

The flora of surface wounds and burns was found to be made up essentially of the staphylococcus aureus and the hemolytic streptococcus, and less frequently of the bacillus pyocyaneus, bacillus proteus, and bacillus coli.

A cream consisting of lanette wax and soft paraffin containing 100 Oxford units per gram of penicillin was used by application every twenty-four or forty-eight hours according to the type of infection. Penicillin appeared more active than the sulfonamides in eliminating streptococci and staphylococci from burns and surface wounds. It also removes streptococci which are resistant to sulfonamides but does not affect the bacillus proteus or bacillus pyocyaneus. Applied every twenty-four hours it will normally remove Gram-positive cocci from an infected raw surface within from four to six days.

When the surface exudate from a wound is only slight, or dry conditions are desired, a penicillin-sulfanilamide powder may be used.

Penicillin does not appear to have adverse effects on skin grafts; in fact, it facilitates grafting of raw surfaces. CONRAD L. PIRANI, M.D.

Magner, W., and O'Sullivan, M. O.: The Sulfonamide Treatment of Wounds. *Canad. M. Ass. J.*, 1944, 50: 118.

Experimental work has shown that in animals inoculated with streptococci or with gas-gangrene organisms the incidence of fatal infections can be greatly reduced by immediate treatment of the infected wounds with one or another of the sulfonamide drugs; whereas a delay of even a few hours in the institution of such treatment leads to a high mortality rate. As there is also clinical evidence of the value of the sulfonamides in the early treatment of infected tissues, it has been advocated that every soldier in the war zones should carry on his person a supply of sulfathiazole or sulfanilamide for the first-aid treatment of wounds. This is desirable as, to be effective, the drug must be applied to the wound before necrosis or suppuration has led to the accumulation of sulfonamide-inhibiting substances at the injured site. Such first-aid treatment should be followed by excision of devitalized tissue and reapplication of the drug at the earliest possible moment.

While early sulfonamide treatment of wounds is good practice, neither sulfonamide powders nor thick sulfonamide-containing emulsions or pastes are entirely satisfactory for this purpose, as in the case of deep or jagged lesions it is impossible to secure their even distribution throughout the lacerated tissues. It would seem that what is needed is a sulfonamide preparation with physical properties which facilitate its spread throughout a wound, and which tend to the production and maintenance of a high concentration of the drug in the bordering tissues.

With these considerations in mind, and having conceived the idea that the addition of a wetting agent to an oily suspension of sulfathiazole might increase its spreading properties in a moist wound, the authors decided to investigate the following points:

1. The concentration of sulfathiazole in the blood at fixed intervals after the insertion into the thigh muscles of guinea pigs of equivalent amounts of dry sulfathiazole powder, a suspension of sulfathiazole in saline solution, a suspension of sulfathiazole in oil, and a suspension of sulfathiazole in an emulsion of the oil-in-water type.

2. The effect of very fine grinding of the sulfathiazole on its rate of absorption from an oily suspension in the tissues.

3. The effect of the addition of a wetting agent on the physical properties of an oily suspension of sulfathiazole, and on the rate at which the drug is absorbed from this suspension by the tissues.

In conclusion the authors state:

1. The widely held belief that the suspension of sulfathiazole in oil retards its absorption by the tissues is erroneous. The rate of absorption of sulfathiazole from the muscles is greatly accelerated when it is injected in saline solution, in oil, or in an oil-in-water emulsion. Absorption is more rapid from oil than from saline solution, and is more rapid from an oil-in-water emulsion than from oil.

2. The rate of absorption of sulfathiazole from an oily suspension in the muscles is influenced by the size of its particles. Finely ground sulfathiazole is absorbed more rapidly than the unground crystals.

3. The absorption of sulfathiazole from an oily suspension in the muscles is accelerated by the addition of a wetting agent to the suspension.

4. Local sulfathiazole treatment of small experimental wounds heavily inoculated with the clostridium welchii is effective if instituted within two and one-half hours after the organisms have been introduced into the wound. With a delay of five hours treatment is ineffective. It is probable that in man accidental infection of this type is always from bacterial spores and that there is a much longer interval than in guinea pigs between contamination of the wound and actual invasion of the tissues by gas-gangrene-producing organisms, during which interval prophylactic treatment with sulfonamides is likely to be successful.

5. It was found that there was no statistically significant difference in the mortality rates in groups of animals treated with sulfathiazole powder and with oily suspensions of sulfathiazole. This is surprising in view of the great difference in the concentration of sulfathiazole in the blood following the insertion of equivalent amounts of these substances into the muscles, and the figures suggest that further work might have shown that the slowly absorbed powder is the more effective bacteriostatic agent.

JOHN E. KIRKPATRICK, M.D.

Anderson, D. G., Oliver, C. S., and Keefer, C. S.: A Clinical Evaluation of Sulfamerazine. *N. England M. J.*, 1944, 230: 369.

The results of treatment with sulfamerazine in 239 patients are presented, together with the toxic manifestations revealed by this group and by 39 additional patients during the course of therapy. As a general rule adults were given 2 gm. of the drug initially, which were followed by 1 gm. every eight hours thereafter. The drug was usually continued for a period of from forty-eight to ninety-six hours after apparent clinical recovery and the abatement of the fever.

The therapeutic efficiency of sulfamerazine was found to be similar to that of sulfathiazine in the treatment of pneumococcal pneumonia, meningococcal meningitis, and erysipelas. The total doses necessary for clinical effectiveness were, on the average, from one-half to one-third smaller than the amounts of sulfadiazine usually administered for similar conditions. Toxic reactions were about of the same character and frequency as those caused by sulfadiazine; a possible exception to this statement was a greater tendency for sulfamerazine to produce leucopenia and to cause rashes and fever.

This study presents additional evidence that sulfamerazine is a potent chemotherapeutic agent and a valuable addition to the sulfamonide derivatives already in general use. WALTER H. NADLER, M.D.

Darke, R. A.: Sensitivity to Topical Application of Sulfathiazole Ointment. *J. Am. M. Ass.*, 1944, 124: 403.

In the present study 5.5 per cent of the patients treated were found to be sensitive to the application of sulfathiazole ointment. The permanence of this sensitivity is not yet known. The contact dermatitis in each case disappeared when the sulfathiazole ointment was no longer applied. Clinically it seemed that healing had been definitely retarded.

In a patient who is being treated topically with sulfathiazole ointment it is becoming recognized that an acute exacerbation of symptoms, locally and generally, may follow the oral administration of sulfathiazole. Because this sensitivity may preclude the use of the drug in the therapy of such diseases as meningitis, pneumonia, and gonorrhea, it is important that sulfathiazole and other sulfonamide preparations be used topically only when the specific need for them is justified.

The indiscriminate use of these preparations in minor conditions, when less harmful drugs are adequate, should be discontinued. With the widespread publicity being given to these preparations it would seem desirable to discourage their sale except by prescription. JOHN J. MALONEY, M.D.

Peterson, O. L., and Finland, M.: The Sulfonamide-Inhibiting Action of Procaine. *Am. J. M. Sc.*, 1944, 207: 166.

Procaine, in amounts ordinarily employed for local anesthesia, may be absorbed into the circulation in sufficient concentration to exert a definite inhibiting effect on the action of sulfonamide drugs that may be present in the blood.

Infection introduced into an area which has been infiltrated with procaine may become established locally in spite of the continuous presence in the body of bacteriostatic concentrations of sulfonamide drugs.

It is desirable to use local anesthetic drugs other than p-aminobenzoic-acid derivatives for infiltration when exploratory punctures of potentially infected areas are made. Procaine, or similar anesthetics of the p-aminobenzoic-acid series, should also be avoided in extensive operative procedures on patients with severe infections for which rapid and effective action of the sulfonamide drugs is essential.

J. M. MORA, M.D.

Herrell, W. E.: The Clinical Use of Penicillin, an Antibacterial Agent of Biological Origin. *J. Am. M. Ass.*, 1944, 124: 622.

It is apparent that penicillin is a highly effective antibacterial agent against susceptible pathogens. The clinical results obtained in 62 cases are presented. Among the cases in which penicillin was used were infections due to staphylococci (aureus), neisseria gonorrhoeae, streptococci, actinomyces, and micrococci. Satisfactory results were obtained in 48 of the 62 cases. The results were doubtful in 3, and failure or death occurred in 11, in 5 of which the patients were suffering with acute or subacute bacterial endocarditis. Excluding the latter 5 cases, the satisfactory results would number 48 of 57 cases (84 per cent).

Both the sodium and the calcium salt of penicillin have been used in the treatment of the bacterial infections reported. Either of these salts of penicillin may be applied locally or administered intravenously or intramuscularly. The calcium salt appears to be more stable than the sodium salt.

The experience in this group of cases seems to justify the conclusion that 40,000 units of penicillin per day is sufficient in the treatment of the infections described. In the author's cases the intravenous drip method of administering penicillin has been the most satisfactory method. In some instances intermittent intramuscular administration may be equally satisfactory. However, if experience proves that larger doses are required for the intermittent intramuscular method than for the intravenous drip method, the former is not the one of choice at the present time. Penicillin should be reserved for sulfonamide-resistant infections insofar as possible. Penicillin therapy is no substitute for sound medical and surgical judgment in the treatment of bacterial infections.

Dawson, M. H., and Hobby, G. L.: The Clinical Use of Penicillin: Observations in 100 Cases. *J. Am. M. Ass.*, 1944, 124: 611.

This is a study of penicillin therapy at the Columbia-Presbyterian Hospital Medical Center, New York, in 100 patients with staphylococcal (37 cases), pneumococcal (19 cases), streptococcal (14 cases), gonococcal (8 cases), meningococcal (2 cases), mixed (14 cases), and questionable (6 cases) infections.

The patients were treated systemically by intramuscular injections in the majority of cases. In some instances additional local treatment was used, and occasionally the intravenous route of administration was chosen. In many instances the dosage employed was smaller than that recommended by the authors in order to conserve the limited supply of penicillin. Many patients had failed to respond to previous sulfonamide therapy.

The staphylococcal infections were divided into two groups: 18 cases with bacteriemia and 19 cases without bacteriemia.

The ages of the patients with bacteriemia varied from nine days to seventy-four years. The cases represented a wide variety of conditions, including 5 of proved acute osteomyelitis. In 15 of the 18 cases the results were satisfactory; in 3 patients there was a relapse but it responded to subsequent therapy; 3 patients died. The dosage employed varied from 5,000 units every four hours to 25,000 units every three hours. The total amount of penicillin given ranged from 20,000 units to 2,250,000 units, and treatment lasted from five to thirty-two days.

The authors draw the tentative conclusion that acute systemic infections and infections in well vascularized, soft tissues respond more promptly and require a smaller amount of the drug than do more chronic infections, especially those in relatively avascular tissue, such as bone. In the former group 10,000 units every four hours would seem to constitute an adequate dose in most instances, while in the latter from 20,000 to 25,000 units are required every four hours. The length of time for which treatment should be continued will vary according to the individual case, but a period of two days after the temperature has become normal would seem to be sufficient in most instances.

The cases of staphylococcal infection without bacteriemia represented an equally heterogeneous group and included 4 cases of chronic osteomyelitis. Satisfactory results were obtained in 15 of the 19 cases. In 3 of the 4 unsuccessfully treated cases the infecting organism was subsequently found to be resistant to the action of penicillin in vitro. In chronic osteomyelitis the results were satisfactory only when penicillin was used in conjunction with adequate surgery. The total amount of penicillin given ranged from 125,000 units to 1,400,000 units, and treatment lasted from two to eighteen days. The recommendations for dosage are similar to those outlined for cases with bacteriemia.

Among the group of 19 patients with pneumococcal infections there were 10 cases of pneumonia, 4 of meningitis, 3 of acute endocarditis, and 2 of empyema.

The results in pneumococcal pneumonia were satisfactory in all cases except 1, a case of overwhelming sepsis in a parturient female. In this case both the blood stream and the pleural fluid were sterile twelve hours after therapy was started, but the patient died at the end of thirty hours, apparently of toxemia. The total amount of penicillin given in this group varied from 70,000 units to 480,000 units, and the duration of treatment was from one to six days. In general, good results were obtained with 10,000 units every four hours for from one and a half to two days. One patient with an infected pleural exudate was treated systemically and intrapleurally.

The 4 patients with pneumococcal meningitis recovered, but it was difficult to evaluate the role of penicillin in 2 patients with associated mastoid and middle-ear infections because they also received sulfonamides and antipneumococcus serum. Sulfonamides were ineffective in the other 2 cases. In 3 of

the 4 cases penicillin was given intrathecally as well as systemically. The best result was observed in a patient who received 20,000 units daily intrathecally for four days in addition to systemic treatment for six days.

The 3 patients with acute pneumococcal endocarditis were treated early in the course of study with inadequate amounts of penicillin. These patients died, but in 2 the blood stream was temporarily sterilized.

The results in the 2 cases of empyema could not be evaluated.

The penicillin treatment of hemolytic streptococcal infections was limited to 2 patients who developed toxic manifestations with sulfonamides, and the results were satisfactory.

Two patients with nonhemolytic streptococcal infections, treated in the terminal stages of their illness, died.

Encouraging results were obtained in the treatment of subacute bacterial endocarditis due to nonhemolytic streptococci. The results in the first 5 cases of this disease treated with penicillin could not be evaluated because the amounts of the drug were wholly inadequate. In 2 of the 5 remaining cases a satisfactory result was obtained; the 2 patients were well thirteen and nine months, respectivelv, after treatment was discontinued. The third patient responded to penicillin on numerous occasions with sterilization of the blood, but the infection recurred shortly after the discontinuance of therapy. The 2 remaining patients died.

Six cases of gonococcal urethritis resistant to sulfonamides were cured clinically and bacteriologically within forty-eight hours. The dose was 10,000 or 15,000 units every three or four hours for two days. A case of gonococcal arthritis of the wrist joint resistant to sulfonamides responded to treatment within forty-eight hours, and a normally functioning joint was obtained. A case of gonococcal arthritis of the knee joint was treated locally by the injection into the joint of 10,000 units daily for three days. The patient was discharged cured on the fifth day.

The experience with meningococcal infections was limited to 2 cases of meningitis. A satisfactory result was obtained in 1 patient who had developed anuria from sulfonamide therapy. This patient received 10,000 units intrathecally on two successive days and 10,000 units every three hours intramuscularly. The result was unsatisfactory in an infant aged seventeen months who received only intramuscular injections. The infection subsequently responded to sulfonamides and antipneumococcus serum.

The 14 cases of mixed infections represented a mixed group bacteriologically and clinically. The majority were mixed infections of staphylococci and streptococci, but in several instances there was a multiplicity of other organisms including gram-negative rods. The results were the least satisfactory of the entire series. Eight of the 14 patients died or had unsatisfactory results. It has been demonstrated experimentally that penicillin is not effective against gram-negative bacilli and that certain of these organisms, including the bacillus coli, secrete an enzyme which destroys penicillin.

Penicillin therapy was ineffective in the group of 6 patients with infections of uncertain etiology. This group included 3 cases of atypical pneumonia.

There were no serious toxic reactions to the administration of penicillin. Prolonged administration did not lead to the development of any intolerance or sensitivity, and there was no evidence that the organisms became resistant to the action of penicillin.

ERNEST E. ARNHEIM, M.D.

ANESTHESIA

Evans, E. I.: Studies on Traumatic Shock. Anesthesia in Clinical Shock. *J. Am. M. Ass.*, 1944, 124: 473.

The result of recent studies in experimental shock indicates that of the four gaseous anesthetic agents studied, namely ether, nitrous oxide, ethylene, and cyclopropane, the last two seemed to be better suited for individuals in shock.

More recently chloroform and the intravenous administration of sodium pentothal have also been studied. Although sodium pentothal cannot be considered superior to cyclopropane, it is certainly better suited for front-line conditions. For intra-abdominal operations, however, pentothal alone is an unsafe anesthetic agent because one cannot secure any reasonable relaxation of the abdominal

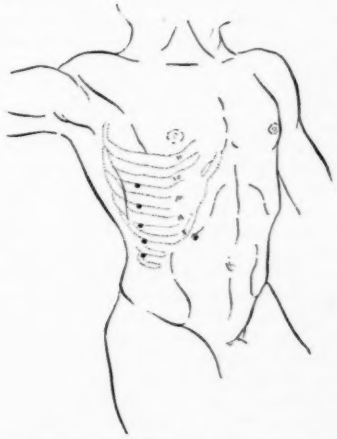


Fig. 1. Diagram illustrating the points of injection for intercostal block anesthesia. A series of skin wheals are made with 1 per cent procaine-epinephrine solution immediately beneath each designated rib in the midaxillary line. The neurovascular compartment is reached with the needle tip (Fig. 2) by pushing the needle just under the rib edge. Five cubic centimeters of procaine solution are introduced into each neurovascular compartment.

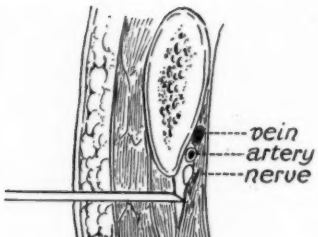


Fig. 2. Position of needle tip.

musculature without the use of very unsafe concentrations of the drug.

In this article the author presents a combined anesthetic method for use in shock after abdominal operations. The method consists of the bilateral intercostal nerve block as outlined by Bartlett (Figs. 1 and 2) for anesthesia in abdominal explorations, associated with the intravenous administration of sodium pentothal. When much intra-abdominal manipulation must be done this method should be combined with some other anesthetic method to insure success (nitrous oxide or splanchnic block).

This method was used in 45 patients in shock following injury of the abdomen. In 23 cases with skeletal injury sodium pentothal alone was used. In all cases there was a reduced blood volume. Morphine sulfate was administered in many instances to cut down on the amount of pentothal needed to maintain an adequate anesthetic level. Oxygen may be given during the pentothal anesthesia and possibly tends to prevent the further development of shock.

This type of anesthesia in shock patients seems to be safe and practical and to have most of the virtues of spinal anesthesia without the risks attached to it. The technique is very simple, and failure to obtain good relaxation is very rare. One of the chief disadvantages of sodium-pentothal anesthesia may be the slowness of recovery when it is used for a long operation. It should also be kept in mind that sodium pentothal is an extremely potent anesthetic agent and, in presence of shock, only small doses may be required to anesthetize the patient fully.

CONRAD L. PIRANI, M.D.

Guttman, S. A.: Caution in the Administration of Demerol to Patients with Intracranial Lesions. *J. Am. M. Ass.*, 1944, 124: 155.

The effect of demerol was investigated on patients with intracranial lesions in whom morphine sulfate is usually considered contraindicated because of its present effect on respiration and its alteration of the pupillary response. Twenty patients were studied. These patients received 100 mgm. of demerol parenterally into the deltoid region. Seven individuals showed an unsafe respiratory depression, that is, a rate of 12 or less respirations per minute for at least fifteen minutes. One had a rate of 8 per minute and another reached a low of 4 respirations per minute. The authors abstracted the histories of 3 of the patients who showed evidence of respiratory depression. An incidence of contracted pupils with sluggish response to light was observed.

The data obtained from this series did not warrant the risk of further clinical investigation on patients with intracranial lesions, and further use of the drug was discontinued. MARY KARP, M.D.

Woodhall, B.: Pentothal-Sodium Anesthesia in Neurological Surgery. *War Med.*, Chic., 1943, 4: 556.

In view of the contradictory opinions regarding the efficiency of pentothal sodium when used in the presence of increased intracranial pressure, some authors lauding its use and others comdemning it, the authors decided to evaluate the place of this agent for major cranial wounds. The essential requirements for a neurosurgical anesthesia involve an agent which should not add unduly to the concomitant shock of a lengthy and frequently bloody operation, and one that is not explosive. Pentothal-sodium anesthesia with air or combined with oxygen was used in 378 varied neurosurgical procedures over a trial period of eighteen months.

Pentothal sodium was used for all patients requiring neurosurgical intervention, with the exception of those under twelve years of age and patients in whom the state of consciousness was impaired to a high degree by increased intracranial pressure.

All patients with increased intracranial pressure received 0.4 mgm. of atropine sulfate or scopolamine hydrobromide, preoperatively; and phenobarbital sodium, 96 mgm. subcutaneously, was given occasionally if the patient was restless. To all other patients from 12 to 16 mgm. of morphine and 0.4 mgm. of atropine sulfate or scopolamine hydrobromide were given one hour before operation.

A 2.5-per cent solution of pentothal was used. Studies were made on 15 patients with normal intracranial pressures receiving pentothal; it was found that the blood pressure fell slightly during the induction of surgical anesthesia. With larger initial doses of pentothal sodium, the resultant fall in subarachnoid pressure was of longer duration and could be maintained by successive fractional doses. Neither undue swelling of the brain nor abnormal congestion of the cerebral vascular system was observed.

Fifty-one encephalographic and 16 manometric studies on patients more than twelve years of age were made with an average dose of pentothal of 1 gm. and an average reaction time of one hour and forty-five minutes. Fifty-three miscellaneous neurosurgical procedures were completed with pentothal

with an average duration of anesthesia of thirty minutes, an average dose of 1.3 gm., and an average reaction time of one hour and fifteen minutes. One hundred and fifty-one laminectomies were accomplished under the agent, the average dose being between 1.32 and 1.8 gm.; the average duration of anesthesia was between seventy-three and ninety-six minutes, and the average time of recovery was between two hours and three hours and forty-five minutes.

Formal craniotomy was accomplished on 63 patients under this agent. It was observed that there was increased vascularity of the scalp and muscle tissues particularly during the performance of cerebellar craniotomy, but there was not undue vascularity over the surface of the brain or during the procedure of lobe resection. The average dose of pentothal was 2.02 gm., the average duration of the anesthesia was two hours and forty-five minutes, and the average recovery time was four hours and thirty minutes.

There were no deaths in this series which could be attributed to pentothal sodium.

It is concluded that with certain qualifications in respect to age and the degree of intracranial pressure, pentothal has proved to be an ideal anesthetic agent for use in intracranial vascular procedures. Experience with its use in neurosurgical operations associated with shock suggests its potential value in major cranial wounds among military casualties.

MARY KARP, M.D.

Hershey, S. G., and Rovenstine, E. A.: The Value of Cyclopropane in the Anesthetic Management of Patients with Recent Severe Hemorrhage. *Anesthesiology*, 1944, 5: 149.

Clinical cases are reported which suggest that cyclopropane is a useful anesthetic agent for patients who have had recent severe hemorrhage. The results on experimental animals lend support to the clinical impression that cyclopropane anesthesia, if not profound, is not contraindicated during shock from hemorrhage. An improvement in the circulation was regularly noted in animals when the drug was given after hemorrhage. There was an increase in the mean arterial blood pressure and pulse pressure, as well as a slowing up of the pulse rate.

A discrepancy in the anticipated progressive decrease in the specific gravity of plasma was noted in 7 of 13 dogs during cyclopropane anesthesia following hemorrhage. Changes in hematocrit values were not unusual. Cardiac irregularities were noted regularly during the study.

It is suggested that some of the observed effects from cyclopropane may be caused by a parasympathomimetic action. J. M. MORA, M.D.

Gallen, B., and Prescott, F.: Pethidine as an Obstetric Analgesic. *Brit. M. J.*, 1944, 1: 176.

Pethidine is an effective obstetric analgesic. It does not, however, produce amnesia unless given with other drugs, e.g., scopolamine and barbiturates.

Two dosage schemes were found to give satisfactory results: (a) an initial dose of 100 mgm. given intramuscularly, repeated one hour later with a chlorobromide-opium mixture or with scopolamine; or (b) 100 mgm. of pethidine given intravenously and followed by 100 mgm. given intramuscularly an hour later, either alone or with scopolamine. In either technique further intramuscular injections of 100 mgm. can be given up to a total of 400 mgm. in twenty-four hours. The first injection is best given when the cervix is dilated two fingers and the patient is having regular contractions.

Given intravenously, pethidine produces analgesia in from five to ten minutes; given intramuscularly, in fifteen minutes. The duration of its action is from three to four hours. Intravenous administration produces a more rapid and powerful initial action, but intramuscular administration is highly satisfactory and equally effective. Pethidine has a definite antispasmodic action on the cervix.

No increase in the incidence of instrumental delivery or obstetric complications was associated with the use of pethidine. Reactions in the mother included vomiting, a temporary rise of the blood pressure, dizziness, tingling of the limbs, and dryness of the throat. Of the babies 91 per cent were normal and active at birth; 9 per cent were slow and required resuscitation. There were no deaths among the babies that could be attributed to pethidine.

HOWARD A. MCKNIGHT, M.D.

Humphrey, J. H., and McClelland, M.: Cranial-Nerve Palsies with Herpes following General Anesthesia. *Brit. M. J.*, 1944, 1: 315.

Thirteen cases of cranial nerve palsy following general anesthesia are reported. All occurred during a period of four months. Two of the affected persons died, while the remainder recovered. The degree of severity varied from subjective trigeminal anesthesia only to a complete picture of encephalitis, but the main features of the case were remarkably constant and readily recognized. The nerves involved were mainly the fifth and seventh, but the third, fourth, sixth, tenth, and twelfth were involved in some cases. Those cases which improved showed improvement on the fifth to the tenth day and milder cases recovered rapidly; whereas, the severe cases still had residual subjective changes after five months. A typical case was reported in detail, as were 2 fatal cases.

No anesthetic drug was common in all cases but all were administered in a circle absorber anesthesia machine. Trichloroethylene was the drug used in only 2 of the cases reported. The possibility of chemical reaction between soda lime and trichloroethylene was discussed, the product formed being dichloroacetylene. It was decided that trichloroethylene should not be used where there is any possibility of its coming into contact with soda lime. Other possible etiological factors were enumerated, such as temperature increase in the environment and virus infection. MARY KARP, M.D.

Mallinson, F. B.: Modern (Nonvolatile) Anesthesia; Observations on 1,000 Cases. *Lancet*, Lond., 1943, 245: 729.

Chloroform and ether are considered the chief anesthetic offenders against a patient's comfort. Chloroform has been widely discarded because of its toxicity. Ether, though for many years the best and safest drug, must now be classed as neither. Its use should, therefore, be avoided whenever possible, and eliminated altogether in the future. Reasons for this contention are the following:

1. Ether causes cardiac dilatation, weakened myocardial relaxation, and peripheral vasodilatation, which ultimately lowers the blood pressure.
2. It causes further profound depression of the cardiovascular system by increasing the permeability of the capillaries.
3. It destroys red cells and reduces the hemoglobin.
4. It causes paresis of the gastrointestinal tract with subsequent gas pain, acute dilatation of the stomach, and paralytic ileus.
5. Albuminuria is present in 25 per cent of the cases subjected to ether.
6. Ether causes an increase in the hydrogenion concentration.

The incidence of respiratory morbidity after ether anesthesia has been quoted in the literature as 15 per cent.

Nitrous oxide, pentothal, and cyclopropane combined with spinal anesthesia or field blocks, when complete relaxation is needed, can cover the whole field of surgery including air-raid and front-line work.

In 1,000 cases anesthetized by modern nonvolatile drugs, the incidence of postoperative vomiting was only 20 per cent, and the total postoperative pulmonary morbidity was 0.8 per cent, compared with 11.9 per cent in a comparable gas-chloroform-ether series.

MARY KARP, M.D.

Babbage, E. D., and McLaughlin, C. W., Jr.: Spinal Anesthesia. *Surgery*, 1944, 15: 476.

A series is reported of 1,344 young naval recruits subjected to corrective surgical procedures under spinal anesthesia. Most of the procedures were of a rehabilitory nature for inguinal hernia, hydrocele, varicocele, or ventral hernia. The remainder of the procedures were for conditions arising during their boot training, such as appendicitis, hemorrhoids, and fractures.

The technique for the administration and control of spinal anesthesia is outlined. The results obtained with procaine hydrochloride and metycaine in 945 consecutive cases are compared. Metycaine resulted in fewer anesthetic failures but was associated with a higher incidence of high sensory anesthesia and thus appeared to be more hazardous. The slightly higher incidence of anesthetic failures with procaine hydrochloride was offset by its greater safety.

In spite of specific, adequate, and enforced prophylactic measures to prevent postoperative pulmonary complications in these healthy young adults, an incidence of 3.1 per cent was noted. The conclusion is drawn that the routine use of spinal anesthesia does not lower the incidence of postoperative pulmonary complications.

EDWARD W. GIBBS M.D.

Hingson, R. A., Ferguson, C. H., and Palmer, L. A.: Advances in Spinal Anesthesia. *Ann. Surg.*, 1943, 118: 971.

The purpose of this article was to present the authors' successful use of spinal anesthesia, the incidence of complications, the indications and contraindications for its use, the technique employed, the addition of present-day improvements and modifications in methods of administration, and a discussion of the types of drugs used. It was found that spinal anesthesia, in a comparative study of 10,000 surgical operations, equaled the safety of general anesthesia, and the likelihood of operating room deaths was no greater with spinal than with general anesthesia. With proper technique the likelihood of serious nerve and meningeal damage was infinitesimal. The agents used in the study included spinocaine, pontocaine hydrochloride, metycaine hydrochloride, and nupercaine hydrochloride. For short procedures spinocaine was found to be the most satisfactory single-dose spinal anesthesia. For operations lasting longer than two hours nupercaine (1 to 1,500) was administered according to the Jones technique. Since 1942 the use of nupercaine was replaced by continuous spinal anesthesia with metycaine in preference to procaine.

The continuous spinal-anesthesia set-up with the advantages of the special hubless spinal needle is described. This needle is smaller and has a safety bead near the collar, a rigid proximal and distal portion, and a malleable center shaft.

The technique of giving the metycaine continuous spinal anesthesia is also described. Spinal fluid is withdrawn at the end of surgery to permit a more rapid return of motor activity, as it was found that withdrawal of from 7 to 20 per cent of the total anesthetic injected occurs after the surgery has been completed, contrary to the usual belief that all of the spinal anesthetic is neurologically fixed in twenty minutes. A total of 5,150 cases were analyzed as to complications. There were 2 deaths from the anesthesia which are described in detail.

High spinal anesthesia and total spinal anesthesia occurred in 42 cases. Twenty-five of these were successfully aided by artificial respiration through the positive-pressure gas machine and the injection of a vasopressor drug. In the remaining 27 Magill intratracheal tubes were inserted, and oxygen resuscitation was used until the patients regained respiratory control.

Neurological sequelae included a case of paralysis of the right sixth cranial nerve eighteen years after the spinal anesthesia. This paralysis has now persisted for a period of two years with little improvement. There were 3 patients who developed foot trouble, 2 recovering completely in two weeks, but 1

has a motor weakness of the peroneal muscles of the right leg persisting after two years. There were 14 cases of hyperesthesia and hyperalgesia. Most of these cleared spontaneously by some required therapeutic regional nerve blocks with repeated injections of novocain. There was 1 case of hemorrhagic meningitis. Headache occurred in 1 per cent of the patients. Fall in the blood pressure occurred in individuals in whom the level of anesthesia was permitted to go higher than the eighth thoracic segment. Postoperative distention and atelectasis were seen as often but not more often than in those cases associated with general inhalation anesthesia. Pentothal made a more compatible supplement than other agents.

The authors believe that the incidence of shock following spinal anesthesia varies directly with the skill and experience of the anesthetist. This method has become a more reliable method of securing relief from surgical pain. MARY KARP, M.D.

Hale, D. E., and Shaar, C. M.: Continuous Spinal Anesthesia. *Anesthesiology*, 1944, 5: 53.

The technique of administering continuous spinal anesthesia as used at the United States Naval Hospitals is given in detail. Advantages of this method over that of the single-dose method are enumerated and include the giving of repeated injections of the drug.

Variations from the usual technique of continuous spinal anesthesia are enumerated. The patient is turned on his side at the opposite side of the mattress so that after the tap is accomplished he can be turned immediately onto the mattress without being pulled to the side. In the event the calcification of the interspinous ligament renders a midline tap impossible, a paramedian tap may be employed. Folded sheets can be substituted for the special mattress and serve occasionally to extend the usefulness of the method.

Seven hundred and three cases in which this method was used are reported. The average duration of the anesthesia was one hour and fifty-two minutes, and the average dose of procaine used was 230 mgm.

The complications compare favorably with those found in a series of cases in which single-injection spinal anesthesia was carried out. This method has proved to be a very valuable addition to the anesthetist's armamentarium. MARY KARP. M.D.

Sarnoff, S. J., and Farr, H. W.: Spinal Anesthesia in the Therapy of Pulmonary Edema; a Preliminary Report. *Anesthesiology*, 1944, 5: 69.

One of the treatments of pulmonary edema involves attempts to decrease the venous return to the heart. This is accomplished by three means: (1) by the patient's adoption of the sitting position; (2) by venesection; and (3) by bloodless phlebotomy. Evidence is brought forward which shows that the venous return in spinal anesthesia is markedly decreased. For this reason it seemed logical to investigate the use of spinal anesthesia in the treatment of pulmonary edema. The method used was the injection of cocaine hydrochloride in doses varying from 175 to 125 mgm. into the subarachnoid space. The anesthetic was administered with the patient in a sitting position and leaning forward. Anesthesia in the 3 cases of pulmonary edema reported attained levels between the sixth and fourth thoracic segments. Spinal anesthesia was used in the treatment of pulmonary edema caused by hypertension and cardiosclerotic heart disease in all cases reported. There was immediate relief of the pulmonary congestion and clinical signs.

The mechanism by which spinal anesthesia acts in relieving cases of pulmonary edema was discussed. It is likely that the pooling of the blood in the relaxed muscles and the subsequent decreased return of the right heart under spinal anesthesia would decrease its stroke volume and therefore allow the left ventricle to withdraw a larger portion of blood, and hence, extra vascular fluid from the lungs.

It appears from the evidence cited that with spinal anesthesia the venous return is diminished to a greater extent than by any other means and is accomplished without a reduction in the hemoglobin.

This method of treating pulmonary edema gives significant supporting evidence for the ventricular balance theory of pulmonary edema.

MARY KARP, M.D.

Lull, C. B.: Some Observations in the Use of Continuous Caudal Analgesia. *Am. J. Obst.*, 1944, 47: 312.

The following is a summary of the "don'ts" which appear in the original article with regard to the use of continuous caudal analgesia:

Don't think that caudal analgesia is applicable for every woman in labor. Don't give it to a patient when there is any question about her mental make-up or when there is any suggestion or suspicion of the presence of any contraindications. Don't start the injection too soon. Don't forget to check the position, station of the presenting part, amount of cervical dilatation, fetal heart tone, pulse, and blood pressure, before the caudal analgesia is given. Don't start the injection until you have the patient surrounded by all of the essentials necessary to meet the emergency in case the dura is entered or a blood vessel is penetrated. Don't give the full injection until ten minutes has elapsed following the initial dose of 8 cc., and make sure that the patient moves her feet satisfactorily. Don't talk about the condition of other patients in the presence of the woman in labor. Don't forget to check the blood pressure and fetal heart tone at frequent intervals. Don't persist in forcing the needle unless you are absolutely certain about the anatomic landmarks. Don't persist in inserting the needle a second time if spinal fluid is aspirated. Don't attempt to use this method without the proper equipment.

The most frequent criticism of this procedure is its questionable safety. If the patient is surrounded

by proper safeguards and is competently supervised from the standpoint of both anesthesia and obstetrics in a well-staffed maternity hospital, then this procedure is safe for both mother and baby. In addition to the relief of pain, there are several equally important beneficial factors associated with continuous caudal analgesia which must be considered when this method is evaluated. They are: the excellent condition of the baby at the time of birth, the delighted mental attitude of the mother, the minimal blood loss, the easy termination of the third stage of labor, and the return of the patient to her room with no signs of exhaustion or fatigue.

Although the author does not expect the profession at large to accept or adopt this procedure in the near future, he is firmly convinced that when carried out under the proper conditions and in the proper surroundings, it is one of the greatest advances known in obstetric practice. EDWARD L. CORNELL, M.D.

Southworth, J. L., and Hingson, R. A.: Continuous Caudal Analgesia in Surgery. *Ann. Surg.*, 1943, 118: 945.

This report is based upon the administration and close supervision of continuous caudal analgesia in 903 patients undergoing various surgical operations.

The anatomy of the epidural space is reviewed. It is pointed out that in about 10 per cent of subjects the hiatus is clinically anomalous. Stress is placed on the importance of a thorough knowledge of the variations of the sacral hiatus in order to introduce a needle correctly into the sacral canal. About five minutes after metycaine has been introduced into the sacral canal, saddle analgesia (inferior to the hub of the caudal needle) indicates that the needle is situated within the sacral canal. Within ten minutes there is usually analgesia of the scrotal or vulval area, and at the end of thirty minutes the level of the effect has reached its maximum height. The sensation of intrinsic pain is the first to be obliterated, then the appreciation of extrinsic pain, and later there is loss of appreciation of temperature. Loss of pain sensation is present up to three segments higher than loss of touch when the maximum level of a given dose has been reached. In surgical procedures it is important to eradicate the sense of touch. The motor roots are affected shortly after the sensory roots, although complete motor-nerve paralysis is unnecessary for the production of muscular relaxation and often does not occur.

Caudal block increases intestinal tonus in the absence of irritative lesions of the bowel. When these are present, intestinal activity and tone is similar to that noted with spinal anesthesia.

Respirations are not affected by high caudal block. Fall in the blood pressure occurs in high caudal block, and depends on the rate of absorption of the drug, the rapidity of sympathetic-nerve paralysis, and the height of the effect. It does not seem to be accompanied by evidence of shock and anoxia as it is in spinal anesthesia. The authors have not used the method in children.

Procaine, pontocaine, and metycaine were investigated as agents for this method. Procaine was found to produce a high incidence of nervous irritability of minor intensity and fleeting duration when employed for caudal analgesia. Pontocaine was somewhat erratic, producing only partial nerve block. Its effect persisted from fifty minutes to six hours. Metycaine was the drug of choice. It was used in a 1½-per cent solution and found to have very little toxic effect. It produced prompt, complete nerve block lasting from one to two hours. The toxic symptoms developing from the injection of local anesthetics and drugs were carefully described along with the pharmacological effects of interest.

This method is considered controllable in level, depth, and duration of effect by regulation of the quantity of solution given at one time and of the speed with which the injection is given by taking advantage of the effect of gravity. Tilting the head of the table down produces higher analgesia. By judicious combination of these methods one can produce varying levels of effect at will. Plate 1 illustrates these principles.

When lower caudal block was required, that is, analgesia to the first lumbar segment, 30 cc. were administered and additional amounts of 30 cc. were given at hourly intervals. When midcaudal block was employed, an initial dose of 30 cc. of solution was administered: five minutes later the sacral area was tested to check the position of the needle; then a second unit of 30 cc. was given and the operating table tilted for surgery in the extremities; the table was tilted down at the foot 5 degrees in order to hold the solution in the lumbar areas. If the surgery was performed in the pelvis or abdomen, the table was tilted down at the head 5 degrees in order to extend the anesthesia more completely into the midthoracic area. Subsequent injections of 40 cc. were given as required in pelvic operations, and the 5-degree tilt of the table was maintained. For analgesia involving T_4 or higher, that is, high caudal block, an initial 30 cc. was given and the table tilted head down 5 degrees. After five minutes the second 30 cc. were given and at the end of a second five-minute period a third 30 cc. Supplementary doses of 50 cc. were used as required.

The authors discuss certain technical details involved in the administration of continuous caudal analgesia, such as choice of instrument and technique of insertion, including precautions; and the postoperative care. Subarachnoid tap was performed 16 times in attempting caudal analgesia. In all but 2 instances clear or bloody spinal fluid flowed back freely into the aspirating syringe. The attempt at caudal analgesia should be discontinued if this complication occurs. An 8-cc. test dose was suggested for beginners or occasional operators.

The postoperative course of patients who have had caudal block is smooth. Atelectasis, distention, urinary retention, vomiting, and phlebitis are very rare. No headache has been observed after the analgesia.

The method has proved beneficial in acute thrombophlebitis, in the treatment of sciatica, strains, and concussions of the lower back, and in intractable pain in the pelvic region.

A disadvantage of this method is its time consumption, but as experience is gained with the method the time interval is greatly shortened.

Complications are thoroughly discussed. Syncope has been observed in numerous patients during or shortly after the initial injection. In no instance has there been any sequelae following this phenomenon, and it is considered due to sudden compression of the dural sac. Nervousness, nausea, and occasional vomiting have occurred, but have not been frequent. Peripheral circulatory collapse occurred twice and was considered due to the combination of a too rapid onset of upper-level analgesia together with too rapid absorption of the anesthetic drug following a bloody tap. No unfavorable sequelae followed either of these occurrences. Infection occurred twice without sequelae and from that time on led to the sealing of the puncture point with a liberal amount of sulfathiazole ointment.

Of the caudal administrations 96.7 per cent were successful. Failures were due to learning, to teaching, and to anomalies of the sacrum. The authors conclude that continuous caudal analgesia is a useful addition to the armamentarium of the surgeon and anesthetist because it has the desirable features of regional and local anesthesia plus controllable duration and level of effect. MARY KARP, M.D.

Lull, C. B., and Ullery, J. G.: Cesarean Section Under Continuous Caudal Analgesia. *J. Am. M. Ass.*, 1944, 124: 90.

Fifty patients were operated on under continuous caudal analgesia. The results were perfect in 48 and failures in 2. The failures were due to the inability to introduce the analgesic agent. The indications for the operation were enumerated in a table in the article. Mental reassurance was included in the usual preoperative preparation of the patient. Quiet in the operating room was considered an indispensable factor. The contraindications for continuous caudal analgesia were gross deformities of the spine, tumors which narrow the spinal canal, local infection about the sacral hiatus, skin infections anywhere on the body, a history of sensitivity to the agent used, and profound anemia, unless supplemented with oxygen inhalation. Placenta previa was considered a contraindication because of the relaxation of the cervix and the possibility of bleeding; also the hysterical patient was considered a poor choice.

Fifty milligrams of ephedrine hydrochloride were given intramuscularly if the patient's blood pressure was below 140 mm. systolic. In the hypertensive case, ephedrine was withheld unless the blood pressure fell below 100 mm. systolic.

An initial test dose of 8 cc. of 1½ per cent metycaine (in isotonic solution of sodium chloride or three chlorides) was administered to check that the needle was not within the subarachnoid space or a blood vessel. Then from 40 to 60 cc. were given according to the size of the patient. The patient was placed on her back and the level of analgesia tested in twenty minutes. From 20 to 40 more cubic centimeters were administered if the level of analgesia was not above the umbilicus on both sides. Usually it took thirty minutes after the first injection to obtain analgesia to a level of the eighth dorsal segment.

In all of the cases reported with the exception of one the malleable needle was used; in this one case the ureteral-catheter technique was carried out.

The average drop of the blood pressure was 26 mm. Immediately after the delivery of the child, the blood pressure regained its normal level.

Recovery of all the patients was extremely satisfactorv, and the amount of postoperative discomfort was minimal. Catheterization was unnecessary. There were no maternal deaths. The minimal amount of metycaine used was 30 cc., the maximum, 320 cc., with an average of 81.8 cc. All babies cried lustily immediately after delivery, and none needed resuscitation. The average estimated blood loss in all cases reported was 100 cc. It was found unnecessary to continue the intravenous administration of ergot or preparations from the posterior lobe of the pituitary gland after extraction of the child.

Morphine and scopolamine were given immediately after the abdominal section to relieve discomfort.

The method used was found superior to any other that had been tried. There was absence of nausea, relaxation of the abdominal wall, and smooth convalescence of the mother. MARY KARP, M.D.

Vauz, N. W., and Mitchell, R. M.: The Influence of Continuous Caudal Analgesia and Anesthesia on the Blood Loss During the Third Stage of Labor. *J. Am. M. Ass.*, 1944, 124: 549.

One of the outstanding benefits to a patient who is delivered under caudal analgesia is the prompt termination of the third stage of labor and the amazingly small amount of blood lost. The placental separation is surprisingly prompt and the abrupt separation and expulsion is accompanied by even less than moderate blood loss.

The average blood loss in the series of 1,000 obstetric cases of delivery under inhalation anesthesia was 192 cc.; the average blood loss in the series of 1,000 obstetric cases of delivery under continuous caudal analgesia was 110 cc. In the entire 1,000 cases under caudal analgesia there was only 1 "trapped" placenta. This occurred when the oxytocic drugs were administered routinely after the second stage of labor was complete. None has occurred since the oxytocic agent has been given after completion of the third stage of labor.

Twice the number of patients had a third stage of labor longer than fifteen minutes with inhalation anesthesia as compared with those who had continuous caudal analgesia.

It is believed that caudal analgesia and anesthesia in obstetrics enables the uterus to approach its normal mechanism more closely. MARY KARP, M.D.

Kellogg, K., and Parrett, V.: The Residual Effect of Prolonged Caudal Anesthesia upon the Neuromuscular System in Dogs. *Am. J. Obst.*, 1944, 47: 327.

Dogs were given prolonged caudal anesthesia with 1½ per cent, 5 per cent, and 7½ per cent solutions of metycaine in normal saline solution with little or no residual damage to the neuromuscular mechanism. Sodium pentobarbital apparently inhibited convulsions in the group of dogs given 7½ per cent metycaine. The height of anesthesia depended on the frequency of injection, and the strength and volume of the solution. Blood pressures were uniformly diminished on administration of the caudal block in 7 animals. Deaths under the anesthesia were due to respiratory failure.

The high incidence of mortality in the animals cannot be explained entirely by the increased strengths of solution used in this experiment. Two dogs died from each of the three different concentrations employed. In view of the high level of penetration of the blue dye, as detected by dissection, it would appear that volumes of solution comparable to the dosage in human beings ascend to higher levels in the animal. A relatively smaller epidural space in the animal might well explain this phenomenon.

EDWARD L. CORNELL, M.D.

Roberts, F. W., and Sellick, B. A.: Continuous Intravenous Anesthesia. *Brit. M. J.*, 1943, 2: 813.

A method for administering continuous intravenous anesthesia is described in detail. Its economy, simplicity, and accuracy are the advantages of this technique over others. The apparatus comprises a positive-pressure drip apparatus for saline infusion consisting of a saline reservoir, drip bulb and tubing, glass aspiration indicator, needle, and a means of providing positive pressure. The positive pressure is produced by a hand bulb or by an oxygen cylinder. Pressure is raised in the saline reservoir to allow the saline solution to flow until all air bubbles are removed. Then the regulating clip is closed and the level in the drip bulb is adjusted by the clip on the side tube. The patient is given a 5 per cent sodium-pentothal solution. Then the saline drip is attached and the needle fixed in position. Subsequent injections of a 5 per cent solution of pentothal are made as required by means of the syringe and needle into the pressure tube.

The advantage of this method is that it eliminates the cumbersome unstable stand required by gravity drips, and as the saline reservoir can be placed quite near the vein, the long lengths of tubings are avoided.

MARY KARP, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Luck, J. V.: Plaster-of-Paris Casts. *J. Am. M. Ass.*, 1944, 124: 23.

Immobilization by encasement in plaster-of-Paris is an indispensable part of the treatment of many war wounds and demands good plaster technique. Good plaster technique means rapid application of the cast, comfort and protection to the patient, the use of a minimum of plaster, and less difficulty in transportation.

Plaster-of-Paris, a powder, transforms to crystals when mixed with water. In the crystalline state it depends principally on compact interlocking of the crystals for its rigidity and strength.

The "critical point" is that time in the setting process when the plaster crystals interlock and give the cast rigidity and strength. Movements of the cast, such as changes of alignment and molding after the "critical point" in the setting process, mean impairment of the ultimate strength of the cast. The later after the "critical point" the cast is manipulated, the greater will be the damage. Of the defective casts analyzed, more had been impaired by manipulation after the "critical point" than by any other single cause.

Detection of the "critical point" requires practice and varies with different brands of plaster, but in general it is that point at which the plaster is of the consistency of thick cream and begins to lose its wet glistening character. When the appearance of the plaster has become dull and the cast is becoming firm, the "critical point" is passed.

Lamination of casts occurs when one layer of plaster-crinoline dries before another is applied, which prevents fusion of the adjacent layers. When fresh plaster is wrapped over a dry plaster surface, the dry surface should first be roughened by scratching it with a sharp knife. This is necessary when casts must be applied in segments, e.g. a cylinder for a shaft fracture of the tibia and fibula, then the foot portion, then the thigh portion.

Most of the plaster-of-Paris and crinoline now available is good. More unsatisfactory casts are the result of poor technique of application than derive from defective plaster-of-Paris and crinoline. To overcome bad technique of application, a great excess of plaster is frequently used. Two or more times the required number of rolls and splints is often used.

A cast does not attain its full strength until the water within it in excess of that needed for "water of crystallization" has evaporated. This process may require several hours for small casts and several days for large ones. Arrangement for air to circulate around the cast until it dries is important. If a large wet cast is kept covered with heavy bedding, the cast may lose its rigidity and become rubbery and useless. This is true especially in humid climates.

The use of such materials as sugar to retard the setting time and salt or borax to accelerate it should be avoided under most circumstances. Cold water effectively retards the setting time and warm or hot water accelerates it. Varying the temperature of the water and the length of the soaking time are usually adequate to regulate the setting time. Water at a temperature of from 70° to 95°F., and a soaking time of about one minute are ordinarily employed.

In the defective casts analyzed, more painful points resulted from friction beneath thickly padded

casts than resulted from pressure when little or no padding was used. When no padding is used a plaster splint is best applied anteriorly and posteriorly before the plaster bandages are applied. The bandages should be "laid on," never "drawn on."

With reinforcing casts that encase the ankle, knee, elbow, and wrist, the reinforcement should be placed front and back and not on the sides. Major reinforcement for the shoulder in shoulder spicas should be over the top of the shoulder and in the axilla; for hip spicas reinforcement should be placed anteriorly, posteriorly, and laterally, with the strongest reinforcement placed laterally.

Splints contribute more to the strength of a cast when they are thick and narrow than when they are thin and wide. Nonplaster splints should be perforated or notched in order to key them into the cast.

When plaster splints and slabs are used alone and not incorporated in a cast, the rules for their application are reversed in two respects to their use in casts. In immobilizing joints moving predominantly in one plane, such as the knee and elbow, splints or slabs used alone are stronger when they extend well up on one or both sides or are used exclusively on the sides. Further, they are better used thin and broad, rather than thick and narrow.

JOSEPH GASTER, M.D.

Johnston, H. A.: Combination of Nail and Screw for the Fixation of Fractures of the Neck of the Femur. *Am. J. Surg.*, 1944, 63: 329.

A slotted screw, which combines the advantages of the screw and the nail for the fixation of fractures of the neck and trochanteric region of the femur, is described; this apparatus is illustrated in Figure 1.

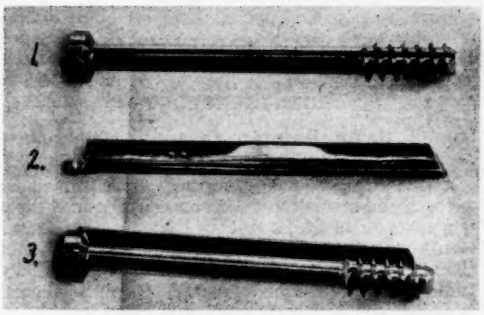


Fig. 1. The combined screw and nail (keyed screw): 1, the screw, threaded only at the end, showing slot from end to end to receive the key; 2, the key, which is to be driven in after the screw is inserted; and 3, screw containing the key. (Courtesy of Am. J. Surg.)

In addition, a leg-holder which facilitates maintenance of the ideal position is described and illustrated in the original article.

The technique used by the author in the insertion of the slotted screw consists initially of a modification of the usual method of insertion of the guide wire under fluoroscopic control, directed by radiographic examination. When the guide wire has been properly inserted, the screw is placed on it and driven into position by a special screwdriver. The depth to which the screw is inserted is checked by fluoroscopy. When the proper depth has been attained, the key is inserted into the slot and tapped gently into position. This device has been used in 54 cases.

HAROLD C. OCHSNER, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Shinall, H. L.: Roentgen Diagnosis of Bronchiogenic Carcinoma. *Radiology*, 1944, 42: 213.

All cases of bronchiogenic carcinoma proved by autopsy and microscopic section occurring in the last five years at the St. Louis City Hospital were assembled. Analysis of the series thus collected shows that there were found at autopsy 40 cases of bronchiogenic carcinoma in which roentgen as well as clinical examinations had been made. Of these, only 6, or 15 per cent, gave a history sufficiently characteristic to indicate clinically, without roentgen examination, the probability of bronchiogenic carcinoma. Thirty-six patients were referred for roentgen examination of the chest; the findings in these, when considered with the clinical history routinely furnished with the x-ray requisitions, led to a diagnosis of bronchiogenic carcinoma in 16 cases, or about 45 per cent. In some instances, other conditions, such as atelectasis or a large pleural effusion, overshadowed the underlying pulmonary lesion and made the diagnosis of malignant growth impossible. If these are excluded, the correct diagnoses amount to 60 per cent, a figure which agrees closely with that of Olds and Kirklin for the roentgen diagnosis of bronchiogenic carcinoma.

Brief reference is made to the various types of bronchiogenic carcinoma, according to Ewing's classification, with descriptions of the pathological and roentgenological findings. Case histories with roentgenograms are included to illustrate the different types. The survey of the cases studied leads the author to state that a unilateral rounded nodular shadow, usually in the hilar region and coupled with certain features of the clinical history, is of the greatest importance in the diagnosis of uncomplicated bronchiogenic carcinoma. A. HARTUNG, M.D.

Hefke, H. W.: Cholecystography with Priodax; A Report on 600 Examinations. *Radiology*, 1944, 42: 233.

Although tetraiodophenolphthalein fulfills most of the requirements for roentgenographic visualization of the gall bladder, the diarrhea, nausea, and vomiting occasionally following its use have stimulated search for a substitute without these untoward effects. In 1940, Dohrn and Diedrich systematically experimented with a large number of iodine-bearing compounds which were capable of being excreted by the liver, and finally selected as the substance most suitable for their purpose, B-(4-hydroxy-3, 5-diiodophenyl)-a-phenylpropionic acid. This is a white crystalline powder, insoluble in water and having an iodine content of 52 per cent. Although a considerable portion of it is excreted with the urine, enough of it is excreted with the bile to render it radiopaque when given orally in doses well within the limits of toxicity. It was tested clinically and some of the investigators considered the diagnostic worth of the new medium equal to that of tetraiodophenolphthalein when administered intravenously.

The author has used priodax, as the preparation is known in this country, in 600 gall-bladder examinations. Administered in tablet form, a total of 3.0 gm. of the active substance constitutes the usual dose. Other details of technique of the roentgen examination follow closely those usually used in cholecystography. Priodax was much better tolerated than tetraiodophenolphthalein as nausea, vomiting, and diarrhea (usually associated with the latter) were markedly decreased in frequency and severity with the former. Slight burning on urination occurred in a few of the male patients. In this series, no instances of iodine sensitivity were observed, nor was there any evidence that the oral administration of priodax had exerted harmful effects on the health of the patients.

Of the 600 examinations with priodax, 80 per cent showed excellent gall-bladder shadows; in 8 per cent the contrast was less intense but considered normal. A poorly functioning gall bladder was diagnosed in 2 per cent of the cases, while in the remaining 10 per cent, there was failure of visualization. Stones were demonstrable in 12 per cent, being observed in both normal and nonfunctioning gall bladders.

In 30 of the cases in which the gall bladder was not demonstrable, the 3-gm. dose of priodax was repeated immediately in order to check the value of a single dose. Only 1 of these cases showed a normal functioning gall bladder following re-examination. This is in marked contrast to the author's experience with tetraiodophenolphthalein, with 1 of 4 cases showing normal function at a twenty-four hour re-examination. At present, the single 3-gm. dose of priodax is considered satisfactory in cases of nonfunctioning gall bladder. A second dose is administered only exceptionally, particularly when there is some question of poor function, with or without stones.

The diagnostic accuracy in the series in which priodax was used, and which was checked by surgery, was 96.7 per cent, compared favorably with the surgical follow-up findings after the administration of tetraiodophenolphthalein. A. HARTUNG, M.D.

Horwitz, T., and Dillman, M. A.: The Effect of Roentgen Rays on the Joint Effusions in Certain Nonspecific Articular Lesions in Human Beings, and on the Normal Joints of Dogs: A Preliminary Report. *Am. J. Roentg.*, 1944, 51: 186.

Six patients with effusions in one or both knee joints in connection with nonspecific articular lesions were treated with roentgen rays by the authors. These cases are tabulated and described as to clini-

cal manifestations, biopsy studies, exact radiation therapy administered, and results obtained. It was found that this treatment was beneficial in the control of the joint effusions and the attendant discomfort, but did not serve to affect favorably the progress and ultimate course of the underlying pathological processes in these cases. Within the recommended doses, no immediate or remote deleterious effects were observed.

Clinical and experimental observations of other workers in connection with similar lesions are cited and various opinions tending to explain the rationale of the use of roentgen therapy in such cases are given consideration.

The more vulnerable articulations of the extremities of 6 normal adult dogs, treated with much larger doses than have been utilized and found effectual in human subjects, have shown no immediate, and, thus far, no remote untoward effects. The effects of such factors as type, dose, and duration of roentgen treatment have been analyzed in this preliminary report.

A. HARTUNG, M.D.

Rowe, E. W., and Frazer, M. D.: Roentgen Therapy of Wilms' Tumor. *Radiology*, 1944, 42: 107.

Wilms' tumor is the most common renal neoplasm occurring in children. The triad of symptoms are: hematuria, pain, and the presence of the tumor. The triad of symptoms need not all be present; any one or two may be sufficient to provide a correct diagnosis. Occasionally, hypertension, vague abdominal pain, and trauma may be associated with this disease.

In order to arrive at an accurate diagnosis, complete roentgenological and urological studies are required. If intravenous pyelography is not feasible, intramuscular urography can be done. Pyelographic films reveal: (1) a tumor mass in the renal region, (2) delay in the appearance of dye, and (3) distortion and displacement of the renal calices and pelvis, and of the ureters by the tumor.

The origin of Wilms' tumor is still debatable and the consensus is as follows: (a) the tumor originates at different developmental periods of the embryo; (b) the nephrotome is a predominating contributing structure and a tumor anlage; (c) there may be multiple tumor cells if the tumor anlage separates before the formation of the nephrotome (this may account for the presence of muscle fibers and other tissue in the tumor). Gross examination of a Wilms' tumor may show it to be solid, cystic, or necrotic. The mass is well demarcated and surrounded by a fibrous capsule. The surrounding kidney is thinned and shows pressure changes due to the tumor. The center of the tumor is gelatinous with strands of muscular, glandular, or cellular tissue. The predominating microscopic feature of a Wilms' tumor is its embryonal nature.

Metastases are generally hematogenous in origin. Common sites are the liver, lungs, and bones.

Various forms of therapy for Wilms' tumor are advocated in the literature: nephrectomy, irradiation, nephrectomy followed by irradiation, preoperative irradiation followed by postoperative irradiation. Each author attempts to prove that his method is the better one.

The authors believe each case should receive a preoperative course of radiation therapy and after a six weeks' interval, nephrectomy, followed by a postoperative course of irradiation is indicated. The rationale for preoperative roentgen therapy is: (1) the size of the tumor is reduced and immediate future surgery is facilitated; (2) the spreading of metastases is minimized by less surgical handling of the tumor; (3) some blood vessels are occluded, which reduces the possibility of hematogenous metastases; (4) the physician is given time to prepare the patient properly for surgery; and (5) the diagnosis can be more readily determined since most Wilms' tumors are radiosensitive.

Four cases of renal tumors in children are reported. One was treated by surgery followed by postoperative irradiation, and the 3 others were given a course of preoperative irradiation, surgery, and postoperative radiation therapy. The first patient died within five months. The 3 others were still alive after four years and nine months, two years, and seven months, respectively.

MAURICE D. SACHS, M.D.

MISCELLANEOUS

Bigelow, W. G., and Lanyon, E. C. G.: Uses for Dry Cold Therapy. *Brit. M. J.*, 1944, 1: 215.

The authors review briefly the recent literature relating to the therapeutic use of cold in connection with amputations for diabetic gangrene and for controlled thawing of lesions of the extremities due to frost-bite and immersion in cold water. Their purpose is to propose a cooling cabinet for the treatment of such lesions and to encourage the investigation of this form of treatment in 3 other types of cases: (1) wounds of the extremities which have impaired the blood supply sufficiently to endanger the limb; (2) traumatic arterial spasm; and (3) peripheral embolism.

The rationale for the cold treatment of frostbite and immersion foot, and methods used by others are described. Fundamentally, similar problems are presented in connection with wounds of the extremities with impaired blood supply, traumatic arterial spasm, and peripheral embolism. The object of the treatment is to reduce cell metabolism until such time as oxygen can be made available to the cell by the blood in sufficient quantity to satisfy the cell requirements at body temperature. In this way an oxygen deficit, which would ordinarily cause death of the cell and gangrene of all or part of the extremity, is avoided during the time that is needed for the return of normal circulation and cell nutrition in the affected limb.

Equipment devised by the authors to accomplish the desired results is described and illustrated. It consists essentially of a cabinet which is cooled by

the circulation of cold brine through coils in the wall, the temperature of the cabinet being regulated by merely adjusting the rate of flow of cold brine. The circulating brine is cooled in a reservoir in a predetermined temperature by a separate refrigerating machine, and is pumped to the limb cabinet through a flexible tube. The apparatus is simple, portable, and flexible in operation, and it has been designed primarily to meet the requirements of an army in the field.

A. HARTUNG, M.D.

Momigliano, E., and Essenberg, J. M.: Regenerative Processes Induced by Gonadotropic Hormones in Irradiated Testes of the Albino Rat. *Radiology*, 1944, 42: 273.

On the basis of experimental studies on 80 rats the authors conclude that spontaneous regeneration of the seminiferous epithelium of the testes of the albino rat after irradiation with a dose of x-rays not exceeding 800 roentgens is irregular and incomplete. Recovery is slow with dosages of 800 roentgens and rare with doses of from 1,000 to 1,200 roentgens.

In spontaneous regeneration, spermatozoa are rarely produced. The newly formed cells are generally limited to the spermatocyte stage. The degeneration of seminiferous tubules is followed by hyperplastic and hypertrophic changes in the interstitial cells. The accessory sex organs show a marked increase in size as contrasted with those of control animals.

Gonadophysin, a gonadotropin of the anterior lobe of the pituitary gland, exerts a manifest restorative action on irradiated testes if injected at or shortly after irradiation and continued for several weeks. Testosterone propionate shows no restorative effect on the x-rayed seminiferous epithelium, but it stimulates the interstitial cells and the accessory sex organs.

HAROLD C. OCHSNER, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Hoelzel, F.: An Explanation of Appetite. *Am. J. Digest. Dis.*, 1944, 11: 71.

The author of this article served as the subject for many of Carlson's hunger experiments as well as independent hunger experiments of his own. The present studies were intended to explain changes in hunger and appetite as manifested by variations of the gastric contents in acidity, volume, and bile. Experiments were made under practically normal conditions. The balloon method for registering gastric contraction and frequent intubation were avoided.

Appetite may be considered as a state of consciousness that determines an appreciation of specific kinds of food. Appetite may be basal or acquired. The former is inherited, the latter is conditioned. Hunger may be regarded as the indiscriminatory desire for food. Hunger represents desire, while appetite represents the appreciation of food. Nevertheless, the two are related in some ways. Taste is an important factor in appetite. During long periods of protein restriction an intense painful desire for meat is developed. Neither taste nor smell is accountable for this desire since in this experiment it was satisfied by the ingestion of raw unseasoned beefsteak. The gastric sensation of pain may be attributed more to the changes in volume and the acidity of the contents of the stomach than to its tonus.

Hunger pain for protein may become intense and manifested by an increased respiratory rate. Protein realimentation relieves this pain rapidly. Gastric function as regards acidity and volume is affected by protein in a specific manner differing from that produced by carbohydrates or fats. As a result of protein restriction, the acidity of the gastric contents is increased and the volume is decreased. Gastric tonus and bile regurgitation are also increased. Gastric contractions are felt only when the contents of the stomach have become so reduced as to permit contact between the contracting walls. The contents of the stomach may contain as little as 5 cc. of fluid before hunger contractions are felt. Duodenal regurgitation is regarded by the author as an abnormal physiological mechanism which does not occur when the individual is well and is in a satisfied nutritional state. During periods of protein hunger this sensation may be dispelled by aspiration of the stomach contents, neutralization with sodium hydroxide, and replacement in the stomach. The sensation then is the same as if the person had eaten meat. Artificial acidification of gastric juice does not induce nor sustain protein hunger after protein has already been ingested.

BENJAMIN G. P. SHAFIROFF, M.D.

VanLiere, E. J., and Northup, D. W.: The Effect of Water Taken with Meals on Gastric Emptying. *Gastroenterology*, 1944, 2: 195.

Twenty-one normal medical students were given a test meal which consisted of 15 gm. of Quaker farina, which had been boiled in water down to a volume of 200 cc. Fifty grams of barium sulfate were added, so that the position of the meal could be determined fluoroscopically. Several determinations of the normal gastric emptying time were made on each individual.

Nine subjects were then given the test meal, and were asked to drink 500 cc. of tap water with it. It was found that the ingestion of this amount of water had no appreciable effect on the gastric emptying time.

Twelve of the subjects were asked to drink 1,000 cc. of water with the test meal. The gastric emptying of eleven of the subjects was not affected by drinking this quantity of water. One subject, however, showed a significant decrease in emptying time.

Relatively large quantities of water taken with meals apparently have no effect on the gastric emptying time in the average subject, although an occasional individual may be affected.

SAMUEL KAHN, M.D.

Wolkin, J., Goodman, J. I., and Kelly, W. E.: Failure of the Sweat Mechanism in the Desert; Thermogenic Anhidrosis. *J. Am. M. Ass.*, 1944, 124: 478.

Heat stroke, heat exhaustion, and heat cramps are well known syndromes due to the effect of extreme heat on the human body.

In this article the authors describe a fourth syndrome involving failure of the normal sweat mechanism in a group of soldiers affected variously by extreme heat. The cases studied did not conform clinically with either heat stroke or heat exhaustion. The typical history was that of a sudden onset of generalized weakness, subjective warmth and discomfort, dizziness, headache, and shakiness. The body temperature for the most part remained below 99° F. These symptoms occurred during exposure to sunlight and were associated with or preceded by the cessation of sweating, limited in each case to the body region below the neck in contrast to the profuse perspiration from the face and neck. The skin of the trunk and extremities presented a fine papular eruption giving to it the appearance of goose flesh. This typical condition was diagnosed in at least 8 patients of 77 admitted with some form of heat disorder.

The early recognition of this syndrome is important as far as the treatment is concerned. This consists of immediate removal from excessive heat and avoidance of exposure until the sweat mechanism has returned to normal. Salt is not indicated and apparently is of no value. CONRAD L. PIRANI, M.D.

Hamilton-Paterson, J. L., and Browning, E.: Toxic Effects in Women Exposed to Industrial Rubber Solutions. *Brit, M. J.*, 1944, 1: 349.

The clinical and hematological pictures of 200 women working with industrial rubber solutions are compared with those of 200 control women. Neutropenia is shown to be the commonest and earliest sign of benzene absorption. There is no correlation between the symptoms complained of and the onset of the hematological changes. Clinical examination alone, therefore, is probably useless for the specific detection of early cases.

White-cell counts should be done on all workers after an exposure of six months. If neutropenia is found, the patient should be transferred to other work, and recounts made after two months. If the count is then within normal limits, the woman can be put back to her original work for a further period of six months, and then retested. If there is no improvement after the rest period, however, the woman should be advised to give up work with benzene, as it is possible that her bone marrow may be permanently depressed. SAMUEL KAHN, M.D.

Ross, P.: Cadmium Poisoning. *Brit. M. J.*, 1944, 1: 252.

Because of the widespread use of cadmium and its salts in industry (in the process of plating; the preparation of alloys; the manufacture of solders, dry batteries, paints, pigments, and metal bearings; and in the car and armaments industries) it is important to recognize the possible toxic effects of these substances. Finely divided cadmium is inflammable, and in the presence of abundant oxygen it produces dangerous fumes of cadmium oxide. When the possibility of such fumes arises, the worker must be protected by either an efficient exhaust system or a suitable respirator.

Manifestations of cadmium poisoning are most marked in the lungs and gastrointestinal tract. The early symptoms are irritation of the eyes and throat, precordial constriction, dyspnea, cough, and prostration. A few hours after exposure the respiratory distress increases; nausea, vomiting, and, occasionally, diarrhea occur; an attack of "ague" with chills and fever is frequent; prostration becomes more marked; pneumonia may occur; and in fatal cases there may be signs of kidney and liver involvement.

Treatment is symptomatic. Cessation from work and bed rest are necessary. Mild cases recover in a few days. With more prolonged exposure recovery is delayed, particularly if pneumonia is a complication. In the few recorded fatalities, death has occurred within ten days. Residual symptoms are nausea, anorexia, weakness of the legs, and slight dyspnea.

The author observed 23 cases of cadmium poisoning resulting from the ignition of cadmium dust by a lighted cigarette. The symptoms were as noted. There was 1 case of pneumonia and no death.

ERNEST E. ARNHEIM, M.D.

Raven, R. W.: The Surgical Aspects of Malaria. *J. R. Army M. Corps*, 1944, 82: 92.

A study is presented of the surgical aspects of malaria. The relationship of trauma and malaria is discussed and illustrated by reference to case histories of patients. Attention is called to the manifestations of malaria of surgical importance and in particular to certain abdominal syndromes which occur. A case of spontaneous rupture of the spleen is described, together with other malarial cases of surgical interest. J. M. MORA, M.D.

Ellinger, F., and Landsman, H.: The Frequency and Course of Cancer in Diabetics. *N. York State J. M.*, 1944, 44: 259.

During their studies with regard to the frequency and course of carcinoma in diabetics, the authors examined the case records of 1,280 diabetics at Montefiore Hospital for Chronic Diseases in New York City, for the period from 1935 to 1941. While earlier contributions emphasize the diabetic point of view, this article emphasizes the oncologic aspect of the condition.

Of this group, 39 patients, or 3.4 per cent, had malignant tumors. In the age decades from thirty-five to seventy-five, malignancies occurred in 27 females as against 12 males. With reference to the site of occurrence, in 14 cases the malignancy was found in the genitourinary tract; in 13, in the female genitalia; in 3, in the respiratory tract; and in 9, in miscellaneous areas—skin, thyroid, liver. Eleven patients were treated by surgery only, 14 by radiation therapy only, 11 by surgery and radiation, and 3 had had no treatment.

The diabetes was classified as mild, moderate, and severe, according to the amount of insulin administered. The treatment consisted of diet control and insulin, and all but 10 patients received insulin in doses varying from 5 to 100 units daily.

From an analysis of the clinical material, the authors conclude that (1) diabetics may develop cancer rather than that patients with malignancy may develop diabetes; (2) the incidence of carcinoma in diabetics in their series is 3.04 per cent, which is in agreement with an incidence of 2.95 per cent in 14,332 cases collected elsewhere. These figures indicate that the incidence of carcinoma in diabetics is at least twice as high as that found in the general population, and the authors point out that while it may still be too early to determine the extent to which a diabetic is more likely to develop malignancy, it is a problem both of clinical and social significance and especially so to life insurance companies.

The site and frequency of carcinoma in diabetics seem to be parallel with these factors in nondiabetics. The authors believe that the diabetic condition influences the rate of malignant growth in that individuals with severe diabetes have a lifetime span of nine-tenths years, whereas that of individuals with mild diabetes averages four and six-tenths years after the onset of the tumor.

In answer to the question of retarded tumor growth in mild diabetes, the authors point to the work of Freund who, in 1885, was able to demonstrate increased blood sugar levels in diabetics who also had malignant tumors; following surgical removal of the tumor the blood sugar returned to normal in all but 1 case, and this patient had a recurrence.

Competitive carbohydrate metabolism seems to offer a reasonable basis for the explanation of the slow growth of malignant tumors in mild diabetes and the relatively high percentage (about 25 per cent) of survivors of five years and longer in the authors' series of tumor patients with diabetes.

BENJAMIN GOLDMAN, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Bigg, E., Jennings, B. H., and Fried, S.: The Use of Glycol Vapors for Bacterial Control in Large Spaces. *Am. J. M. Sc.*, 1944, 207: 361.

The bactericidal effect of germicidal mists and vapors on air-suspended micro-organisms has now been well established and demonstrated by many investigators. As a result of recent studies it appears that propylene or triethylene vapor offers certain advantages over the use of aerosols and mists which were previously advocated. The glycols in vapor form are effective in such low concentrations as to be imperceptible in the treated space; they are odorless and nontoxic in the recommended quantities, and the amount necessary to produce air sterilization is so small that the cost is minimal.

Most studies up to this time have been carried out in small test chambers and there has been little accurate data available on large spaces. The chief obstacles to more careful study and application of glycol control of air-borne infections in a practical way have been the absence of effective and simple methods of introducing and maintaining adequate concentrations in the desired space and the knowledge of distribution of the vapor in the space. This study reports findings on the distribution.

The authors found that the production and maintenance of glycol vapor in adequate concentrations in large spaces is possible and readily attainable. Since the authors made the observation that there is ready diffusion of vapor about the space to be treated, it would theoretically be possible to introduce glycol vapor into a space and allow it to distribute itself spontaneously. However, from a practical standpoint this would never be adequate to insure uniform distribution because of air currents in and out of the space and leakage of air out of the space. Thus, it is necessary to have some means of air agitation. This may be produced either by circulating fans or a simple duct system (Fig. 1).

Bactericidal activity occurs in large spaces as well as small test chambers. Concentrations of 0.2 mgm. per liter of propylene glycol and of 0.005 mgm. per liter of triethylene glycol are necessary for the immediate killing of the air-borne micro-organisms.

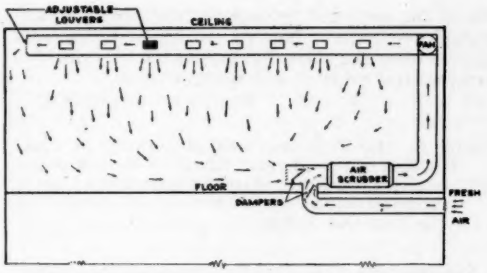


Fig. 1. Layout of duct system for distribution of glycol vapor.

Lesser concentrations may suffice to control air-borne disease.

The necessity for maintaining adequate humidity, in the region of 40 per cent, raises certain difficulties in the problem of maintaining bactericidal activity. Since the greatest incidence of respiratory disease occurs during the cold periods of the year and since cold weather is accompanied by relatively low humidities in heated spaces, water vapor as well as glycol vapor must be introduced into the space. If an air-conditioning unit is in operation this may readily be done; however, since such apparatus is not usually available, moisture must be added in some other way. It may be introduced in the form of steam or may be produced along with the distribution of the glycol vapor.

JOSEPH K. NARAT, M.D.

DUCTLESS GLANDS

Potter, E. B.: Acute Goiter Due to Cyanate Therapy. *J. Am. M. Ass.*, 1944, 124: 568.

Acute goiter following the administration of cyanate preparations for hypertension has been previously reported by other observers. The condition is characterized by a sudden and often painful enlargement of the thyroid gland which suggests an acute thyroiditis. The basal metabolic rate shows no deviation from normal. The gland returns to normal size when the drug is withdrawn. The author believes that this is not a new pathological entity but one that has been incorrectly diagnosed, both clinically and microscopically.

Two cases are reported. The gross appearance of the thyroid gland was that of a smooth surface with discrete nodules. On section the tissue was firm and resembled hyperplastic thyroid tissue. The microscopic picture revealed a solid cellular pattern with small acini, scanty or absent colloid and epithelium, varying from cuboidal to columnar in type. The microscopic appearance differed from that of toxic diffuse goiter in that the acini did not have the papillary infolding of the epithelium and the colloid stained brilliantly as though it had been concentrated. Vacuolation was absent. In the cyanate goiter lymphoid follicles were absent. The irregular-

ity of the acini and tendency toward invasion suggested neoplasm. Clinically neither of the 2 cases gave evidence of hyperthyroidism, but they did give mild clinical evidence of hypothyroidism.

BENJAMIN GOLDMAN, M.D.

Haik, G. M.: Progressive Exophthalmos in Toxic Disease of the Thyroid Gland: A Review of the Recent Literature, with the Report of a Case of Progressive Post-thyroidectomy Proptosis in a Six-Year-Old Negro Girl. *Arch. Surg.*, 1944, 48: 214.

The various theories advanced to explain exophthalmos include: (1) sympathetic overactivity; (2) relaxation of the extraocular muscles; (3) contraction of smooth muscle in the floor of the orbit; (4) vascular anomalies, including dilatation of the orbital vessels with congestion of the vascular bed of the orbit, and retrobulbar venous engorgement; (5) increase in the orbital fat; and (6) edema of the normal orbital contents, which may or may not be associated with edema of the extraorbital structures and hypertrophy of the extraocular muscles.

Both experimental and pathological evidence points to edema of the orbital structures, with or without muscular hypertrophy, as a reasonable explanation of exophthalmos. The fundamental cause of the edema is not definitely understood. Means and his associates believe exophthalmic goiter to be a state of "total endocrine imbalance," and call attention to the fact that the thyroid and its hormone and the anterior lobe of the pituitary gland and its thyrotropic hormone are apparently concerned with water balance as well as with metabolism. The thyroid hormone has been shown to promote diuresis and the thyroid-stimulating hormone of the pituitary gland to promote the storage of water.

The most difficult explanation of all is why exophthalmos progresses after thyroidectomy in a small proportion of cases, since if it does not completely regress in the majority, it at least becomes stationary or shows no gross increase. The theory that it progresses because enough thyroid has not been removed is untenable, nor is hypothyroidism a reasonable explanation.

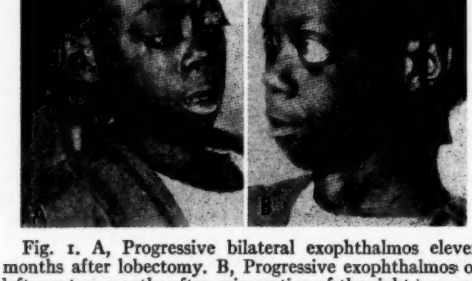


Fig. 1. A, Progressive bilateral exophthalmos eleven months after lobectomy. B, Progressive exophthalmos of left eye two months after evisceration of the right eye and thirty-five days after second-stage thyroidectomy.

Means and his associates have made two classifications of hyperthyroid disease; in one, thyrotoxicosis is the major problem, and in the other, which they have named "Graves' disease with dissociation of thyrotoxicosis and ophthalmopathy" and which they designate as the "special ophthalmic type," ophthalmological considerations are predominant. In this ophthalmic type thyrotoxicosis is mild, absent, or readily controlled; the thyroid gland is not notably enlarged; and more males are affected than females. The ocular signs also differ somewhat from the classic type. The exophthalmos is relatively slight, but there may be marked periocular edema, chemosis of the conjunctiva which is sometimes accompanied by massive swelling, hyperemia of the conjunctiva, and smarting and excessive lacrimation. Ophthalmoplegia and diplopia are frequent.

Two operative procedures for the correction of exophthalmos are the Naffziger and Sewall procedures. Means and his coworkers have outlined a plan of treatment of the "special ophthalmic type" of hyperthyroidism which includes the use of iodides, for its effect on the basal metabolic rate and of thyroid extract for its diuretic effect. If the thyrotoxicosis is so severe that it must be treated, radiation therapy is preferred to surgery. The irradiation therapy is preferred for its more gradual effect on the hormonal balance, which permits a more gradual readjustment of the optic structures.

The author presents the case history of a negro child six years of age with progressive exophthalmos that failed to respond to graded thyroidectomy. The right eye was enucleated and the child died of leptomeningitis following the Naffziger operation on the left eye.

EARL O. LATIMER, M.D.

Wilhelm, S. F., and Gross, S.: Surgical Removal of Adrenal Adenoma with Relief of the Cushing Syndrome. *Am. J. M. Sc.*, 1944, 207: 196.

In November, 1941, a forty-six-year-old man entered the hospital with a classical Cushing syndrome. A diagnosis of diabetes and hypertension had been made previously. Extraction of teeth, tonsillectomy, and vaccine injections had not given relief. The patient had been sexually impotent for six months; there was marked adiposity of the face, neck, and abdomen; the face and neck were dusky red and there were purplish striae on the abdomen.

The blood pressure was 190 systolic and 118 diastolic. The glucose measured 4+ in the urine and a heavy trace of albumin was also found; the blood glucose measured 168 mgm.; the blood nonprotein nitrogen, 35 mgm.; the red blood cells numbered 4,930,000; the hemoglobin showed 100 per cent; the white blood cells numbered 7,600; the polymorphonuclears showed 70 per cent; the mononuclears 30 per cent.

Roentgengrams of the skull showed diffuse osteoporosis. Excretory urography revealed a large circular shadow in the right suprarenal region with downward displacement of the right kidney. Following the perirenal injection of air, a large tumor was observed, roentgenologically, in the right suprarenal region. Androgen determination of the urine showed a marked elevation. Estrogen excretion was within normal range.

The patient lost 10 lb. on a salt-poor diet and the blood pressure fell to 152 systolic and 104 diastolic. The patient was operated on in December, 1941, through a lumbar incision. The kidney appeared normal, and above it there was an encapsulated mass about the size of an orange. The tumor was attached by a narrow vascular pedicle which was ligated and excised. Pathologically, there was a small cap of suprarenal tissue on the large tumor. No medullary tissue was found.

The tumor was diagnosed as an encapsulated adrenal adenoma. A chemical analysis of the tumor showed 1.14 mgm. of androgenic 17-ketosteroids per gram of tissue, or a total of 323.76 mgm. for the tumor. Adrenocortical extract and cortate were given in divided doses postoperatively. In addition, 40 mgm. of testerone were injected.

There was considerable variation in the blood pressure and temperature. The pulse was rapid and irregular, and the patient was weak. Vitamins and calcium gluconate were administered; normal saline solution and 5 per cent glucose were given intravenously. The patient had a rather stormy convalescence, along with a wound infection.

On April 8, 1942 the man was seen again. He complained of weakness but felt well otherwise. His physical appearance had changed remarkably; he was thin and he looked younger. The red coarseness of the facial skin had disappeared; his blood pressure was 140 systolic and 100 diastolic; sexual potency had returned. On March 13, 1943, the patient stated he felt perfectly well, but that he tired upon heavy exertion. Systolic pressure at this time was 128, and diastolic pressure, 85.

The danger of overtreatment with adrenocortical extract, desoxycorticosterone, and saline infusion was successfully combated by discontinuance of the treatment from the seventh to the twelfth postoperative day, and by the prompt administration of mercupurin, potassium chloride, and 5 per cent glucose in distilled water.

RICHARD J. BENNETT, JR., M.D.

EXPERIMENTAL SURGERY

Evans, E. I., Hoover, M. J., James, G. W., III, and Alm, T.: Studies on Traumatic Shock: Blood Volume Changes in Traumatic Shock. *Ann. Surg.*, 1944, 119: 64.

By means of the Gregersen Gibson method—dye T 1824 and the spectrophotocolorimeter—for the estimation of plasma volume in patients who have experienced various types of trauma, it has been found that signs of severe shock do not ordinarily appear unless the blood loss is greater than 15 per cent. The average blood loss in severe traumatic shock has been about 38 per cent, no matter what the nature of the trauma. In the analysis of dye disappearance curves, no evidence of increased generalized capillary permeability has been found in traumatic shock. From hematocrit studies, it is evident that what is lost early in traumatic shock in the zone of injury is whole blood, not plasma.

Severe depletion of the blood volume appears to be the most important single factor in the causation of traumatic shock. A decline in blood pressure levels appears to be the most valuable clinical sign in its early diagnosis. SAMUEL KAHN, M.D.

Evans, E. I., James, G. W. III, and Hoover, M. J.: Studies on Traumatic Shock. The Restoration of Blood Volume in Traumatic Shock. *Surgery*, 1944, 15: 420.

The loss of blood or plasma in traumatic shock is associated with only a slow restoration of plasma volume. From three to four days may be required for the attainment of normal plasma-volume levels. After shock the plasma volume is not restored to normal until new plasma protein is drawn into the circulation. The plasma volume is not restored after shock by replacement with protein-poor fluids withdrawn from the extravascular system.

There are apparently no red-cell reserves available for the replenishment of red cells lost in traumatic shock, either immediately or for from three to four days after the injury.

The proper therapy for traumatic shock after the emergency treatment with plasma is the administration of adequate amounts of whole blood to replace the lost red-blood cells. SAMUEL KAHN, M.D.

Aub, J. C., Brues, A. M., Dubos, R., Kety, S. S., Nathanson, I. T., Pope, A., and Zamecnik, P. C.: Bacteria and the "Toxic Factor" in Shock. *War Med.*, Chic., 1944, 5: 71.

Aub and his associates have investigated the possible elaboration of shock-producing toxins in damaged tissue. They produced a state bordering on shock in dogs by occluding the blood supply to the triceps surae muscles for five hours, and the fluid exuding from the ischemic muscles was injected intravenously into other dogs. In 9 of 32 such experiments the fluid was toxic and produced manifestations of shock, which were usually fatal.

In spite of aseptic surgical precautions these fluids were always contaminated. The fact that 72 per cent of the fluids were nontoxic drew attention to the fact that bacterial products might be the possible cause of the inconstant shocklike picture. A correlation was noted between the toxicity and the growth of bacteria, and when more than 5×10^8 clostridia per cubic centimeter were present, the fluids were toxic and produced shock.

Anoxic muscle in vivo was shown to be an excellent medium for the growth and toxin formation

of clostridial organisms of the gas-gangrene group. These organisms were found to be common inhabitants of dog skin, and they find their way readily into the underlying tissues during operative procedures. It is possible that they are normal inhabitants of dogs' muscles. The potent toxins produced by the clostridia, "in addition to their general effects on the circulation, could be a factor in the production of shock through local loss of fluid at the site of bacterial growth."

As the authors state, "These observations have important implications for physiological experiments and a probable application to the problem of clinical shock." Their importance also lies in the fact that therapeutic agents are available.

EDWIN J. PULASKI, M.D.

Prinzmetal, M., Freed, S. C., and Kruger, H. E.: The Pathogenesis and Treatment of Shock Resulting from the Crushing of Muscle. *War Med.*, Chic., 1944, 5: 74.

The authors were dissatisfied with the evidence either for or against the importance of the toxic factor in shock, and devised experiments of their own to test whether or not a toxic factor exists and to evaluate its relative importance in the development of shock. Their experimental evidence is presented in eight classifications as follows:

Experiment 1. Unsuccessful attempts to produce shock by shooting projectiles into the thighs of dogs. In none of 24 anesthetized dogs shot in the thigh with various types of projectiles did shock develop, and only relatively little swelling of the traumatized limbs was observed. The authors believed it likely that shock was not induced by this method because insufficient damage was inflicted.

Experiment 2. The production of shock by the crushing of surgically excised muscle. In order to produce greater and more uniform tissue damage the quadriceps muscle of anesthetized dogs was removed by means of a sterile surgical technique, ground in a sterile mortar, and then replaced into its original bed, after which the incision was closed. The crushed muscle amounted to from 3 to 5 gm. per kgm. of body weight. Of 12 dogs thus operated on, all were obviously in shock at the end of twenty-four hours, and 9 died within two or three days. These animals usually showed some degree of hemoconcentration, and in 7 or 8 of these animals the blood volume was reduced. Some swelling of the extremity and flank was observed, but bisection according to Blalock's technique revealed that in none of 5 dogs was the local loss of fluid greater than 3 per cent of the body weight, and usually it was less. The authors believed that this amount of fluid loss was not sufficient to account for death.

Experiment 3. Shock is not produced by uncrushed muscle. As a control for experiment 3, 9 dogs were subjected to the same experimental procedure except that the muscle was replaced in its bed without crushing. These animals showed no significant changes in their blood composition or volume, had less local edema than the animals in experiment 2, and none of them went into shock. The authors felt that these findings disproved the neurogenic factor in shock since the amount of stimulation of the nervous system was the same whether or not the replaced muscle had been previously crushed.

Experiment 4. Proof is obtained that the shock is due to crushed muscle. At varying intervals after replacement of the crushed muscle into its bed the incision was reopened and the crushed muscle removed. With débridement at from four to seventeen hours, none of 11 dogs died or displayed symptoms of severe shock, at seventeen hours 1 of 5 dogs died in forty-eight hours and the others appeared seriously ill for a day or so and then recovered; and débridement performed twenty-four hours postoperatively resulted in the death of 4 of 5 dogs within forty-eight hours. In 6 animals the crushed muscle was débrided four hours after the original operation and placed in a refrigerator at 5°C. All of these dogs were healthy four days later, at which time the previously removed crushed muscle was transplanted into the fascial spaces of the opposite thigh; all 6 dogs then acquired typical shock, but 4 slowly recovered. These findings were thought to indicate that crushed muscle contains or elaborates the shock-producing factor.

Experiment 5. The toxic nature of shock. In order to rule out the importance of a local loss of fluid as a responsible factor for the development of shock, plaster casts were applied to the treated extremity of 16 dogs immediately after the reinsertion of crushed muscle. Shock occurred in 13 of these animals, 11 of which died within seventy-two hours. At this point in their report the authors state that the shocklike condition must be due to the systemic absorption of toxic products liberated by the crushed muscle since both neurogenic and local fluid-loss factors had been eliminated (experiments 3 and 5).

Experiment 6. Bacteriologic studies. Autopsy cultures of the crushed muscle always yielded organisms, and direct smears of the muscle revealed pronounced bacterial contamination in all instances. Hemolytic streptococci, hemolytic staphylococci, diphtheroids, the clostridium welchii, and other organisms were frequently found.

Experiment 7. Prevention of shock by antibacterial agents in cases of crushed muscle. Ten dogs were given sulfamerazine orally before and after operation, and the excised crushed muscle was soaked in acriflavine and implanted into its bed together with a quantity of sulfamerazine and in no case did shock occur. Six of the autopsy cultures of the crushed muscle were sterile and few organisms were found in the remainder.

Experiment 8. Prevention of shock by the systemic administration of sulfamerazine. This drug was given orally to 6 dogs before and after operation, and to 10 dogs intravenously immediately after operation and orally thereafter, and in none of the 16 was shock encountered. Autopsy revealed little evidence of infection and the cultures of the crushed muscles were either sterile or yielded few organisms.

The authors refer to the shock caused by this muscle-crushing procedure as "toxic shock," and point out the difference between this condition and that demonstrated by Blalock. For the latter, a more acute form, they coin the name of "extravasative shock." They feel that "toxic shock" produced by muscle crushing is due to the systemic absorption of toxic substances produced in crushed muscle as the direct result of the action of bacteria, and that "extravasative shock" is mainly due to local accumulation or loss of fluid. They conclude that plaster casts may be of value in the prevention of the acute type of shock, but that they are without effect in toxic shock, the treatment of which should include early débridement and the use of antibacterial agents.

PAUL W. SCHAFER, M.D.

HOSPITALS; MEDICAL EDUCATION AND HISTORY

Dorst, S. E.: Effects of the Accelerated Program of Medical Schools on Faculty and Students After Eighteen Months' Experience. *South. M. J.*, 1944, 37: 63.

The author sees little reason for the speeding-up of the premedical program. It cannot produce more doctors and its only achievement will be the production of younger doctors. Regardless of the tempo of premedical education, the medical schools of the nation can accept only 7,500 students every nine months. This is an absolute "bottleneck" and it cannot be expanded since all schools have already increased their student bodies to the maximum number which can be accommodated by the several physical plants. A more deliberate and thorough premedical training would in no way lessen the number of physicians to be graduated during the war years. Instead, there would surely be better physicians, and the loss because of failure in medical school would undoubtedly be appreciably smaller.

Dorst also urgently implores that those who have the facts and who are in authority consider most critically the absolute need for further depletion of medical faculties before irreparable damage has been done to the schools of medicine. The overall effects of acceleration, both premedical and medical, should be constantly judged in terms of the end desired.

These things have happened to medical education: an accelerated program has been adopted which attempts to accomplish in from fifty-one to fifty-four months what has previously been done in from seven to eight years; the student body throughout the nation has been increased by approximately 12 per cent; the medical faculties have been depleted to a most dangerous extent; the internship has been reduced to nine months; only a small number of young physicians will be permitted to continue in graduate resident training, and most of these will have such training limited to nine months, while a few will be continued in residency for eighteen months—the teaching hospitals will therefore be critically understaffed.

J. M. MORA, M.D.

Garrod, L. P.: Hospital Dust: Light as a Hygienic Safeguard. *Brit. M. J.*, 1944, 1: 245.

Dust has been recognized as a vehicle of infection for many years, but preoccupation with "droplet" spread has obscured its true importance until recent times. Cross-infection, by dust or other agent, is particularly liable to occur in hospital wards where there are many open wounds, and the war has therefore called concentrated attention to its mechanisms. The oiling of floors and of bedclothes is now recognized as a valuable safeguard in diminishing the amount of atmospheric dust, and, thus, the chances of cross-infection by this means.

Under the conditions existing in some of the wards studied by the author, dust was so infectious that without the aid of any other vehicle it could well have caused all the accidental infections observed. In wards occupied by patients with hemolytic streptococcal infections, dust may contain the organisms in large numbers, particularly that which collects near infected patients' beds. Hemolytic streptococci were found to be most numerous in floor dust, but were absent from many specimens of dust in the same wards collected from sites on or close to the windows. They were more often found in dust from exceptionally dark wards than in comparable specimens from normally lighted wards.

The author draws attention to the possible importance of good natural illumination as a hygienic safeguard. It has been shown that hemolytic streptococci naturally present in dust will survive for over six months in the dark. Prolonged ward epidemics with long intervals between fresh cases are readily explicable in such conditions. It was found also that dust on or close to windows never contained hemolytic streptococci, whether exposed to direct sunlight or not. Whether this is an effect of light, on is partly or wholly explicable on other grounds, cay be settled only by further observations. Ordinary diffuse daylight is bactericidal to hemolytic streptococci. The interposition of glass does not prevent this effect; it occurs even in winter in England.

These facts suggest the possibility that good natural lighting may be a factor in preventing the atmospheric spread of infection in surgical wards and elsewhere. The quantitative study of bacteria in natural dust in vitro is beset by difficulties, and it is not claimed that direct proof of the disinfectant action of light on this material has been obtained.

Preoccupation with the ultraviolet part of the spectrum has led to a common belief that only direct sunlight is usefully bactericidal; it must now be recognized that ordinary diffuse daylight, even on a cloudy day and even in winter in England, can be lethal to bacteria, and that glass is no absolute bar to this effect.

JOSEPH K. NARAT, M.D.

Shooter, R. A., and Waterworth, P.: Transmissibility of Hemolytic Streptococcal Infection by Flies. *Brit. M. J.*, 1944, 1: 247.

The authors' attention was directed to the possibility that cross-infections in surgical wards might

be conveyed by flies. Wounds and septic dressings attract flies, and in some circumstances absolute protection cannot be secured.

In September, 1942, when flies abounded in the authors' hospital, it was decided to catch some and cultivate them. They were trapped in a Petri dish containing blood agar, one-half of the plate being spread with three drops of 1-in-3,000 gentian violet as recommended by Fleming, and simply incubated in the plates, their busy wanderings on the surface of the medium being relied on to inoculate it with whatever bacteria might be on their feet. After overnight incubation the flies were found dead.

The flies were caught in two surgical wards where there were cases with streptococcal infections; a control series was caught in the laboratory. Of 27 flies caught in these wards, 3 gave sterile plates, 9 gave cultures containing hemolytic streptococci (3 of which proved to be of group A), and the remainder grew a variety of other organisms, including coagulase-positive staphylococci and coliform bacilli; 2 plates were overgrown with the bacillus proteus. Of the cultures from 22 flies caught in the laboratory, 5 were sterile and 2 overgrown with bacillus proteus, and the remainder grew a variety of unidentified organisms; there were no hemolytic streptococci in any culture. Two of the three group A strains isolated from ward flies proved to be of type 4 which had been identified only once previously —in a sore throat in a nurse ten days before the infected flies were caught. It is possible that this nurse conveyed the infection to a wound in which it escaped recognition.

These observations do not prove the transmission of hemolytic streptococcal infection by flies, but they strongly suggest its possibility. When infection spreads otherwise inexplicably from one part of a hospital to another this agency should perhaps be considered. JOSEPH K. NARAT, M.D.

Stephen, R. L.: Hospital Infection of Wounds. *Med. J. Australia*, 1944, 1: 124.

After almost a quarter of a century of modern medicine, the danger of hospital infection is practically the same as it was toward the end of the last war. In the wards, the three main sources of danger of wound infection are contact, droplet infection, and dust, and the danger of cross-infection of wounds is increased with every patient with a "dirty" wound who is admitted. From an orthopedic standpoint, this increased danger arises mainly from open wounds in limbs, the result, generally, of street or machinery accidents. Immediately upon arrival, the casualties should be taken to antishock rooms and kept there until they are fit for operation; they should not be admitted to the surgical ward. During this period attempt is made to control infection by an antiseptic agent, and proflavine (1:1000) is recommended. Débridement is, however, the important treatment and should be adequately done in the operating room. The skin surrounding the wound is carefully cleaned and scrubbed with soap and water and then with alcohol and iodine. The skin edge is then excised and foreign bodies are removed from the wound. After this the instruments are discarded and clothes changed, and a thorough débridement is done. Sulfanilamide powder is insufflated into the wound and the wound sutured without tension, and if the wound has been seen under six hours after the accident, any unsutured areas are packed with vaseline gauze and a cast is applied. Antitetanic serum and gas-gangrene antiserum are given as a routine measure. The patients are then adequately spaced in the wards and given sulfanilamide therapy until the temperature has been normal for several days and the blood picture allows its discontinuance.

Unfortunately, there are the occasional "clean" cases in which the disaster of infection occurs at operation. Although a few of the cases may be beyond the surgeon's control, most of them are due to errors in the operating-theater procedure. It is advocated that all surgical work be done with instruments and that the hands do not touch the patient at all.

LEROY J. KLEINSASSER, M.D.

Kinsella, V. J.: The Prevention of Hospital Infection of Wounds. *Med. J. Australia*, 1944, 1: 121.

Estimates based upon extensive investigations show that clean surgical wounds become infected through hospital contamination in from 5 to 15 per cent of cases. The percentages are much higher in accident wards filled with patients who have open and discharging wounds. The results of the infection vary from slight delay in the healing of the wounds to the death of the patient. Leriche has made the suggestion that, apart from its obvious clinical pyogenic effects, contamination of wounds, if of small degree, may result in masked or imperfect infection which cannot be detected clinically but produces effects on tissues which hitherto had not been ascribed to the proper cause. This might account for wounds that widen, develop keloids, become painful and blue, develop a hard sclerotic substratum, and wounds which give way and lead to hernia, and it may account for peritoneal adhesions, phlebitis, and embolism.

The resistance of the tissues is important in preventing infection. This means that (1) trauma is minimized and (2) the circulation of the blood and lymph is better. At operation, bruising, rough handling and tension must be avoided; hemostasis must be thorough; and hematomas must not be left in wound spaces. Other supportive measures are splints, elevation of the part above the heart level, rest, and the use of general measures, blood transfusion, and chemotherapy.

Lister regarded the air as being an important source of contamination and used sprays. This theory was neglected for a long time, but now, contamination from the air is known to play a major role in present-day hospital infection in wounds. The chief reservoirs of hospital infection are human throats, noses, skin, and wounds which are themselves infected. The streptococcus pyogenes nor-

mally inhabits from 5 to 30 per cent of human throats and occasionally the nose; the staphylococcus pyogenes lives in the skin of from 10 to 20 per cent of human beings. The nose is probably the primary source of the staphylococcus, which infects not only the wound of the patient, but also the skin of the carrier. Those who are not permanent carriers of the pyogenic organisms in the pharynx or nose may become temporary carriers.

From these primary reservoirs, infection is transferred to the secondary reservoirs, the dust on the floor and other surfaces, the blankets, the soiled dressings of wounds, including plaster casts, and all the instruments and equipment used in a hospital ward or theater. The bacterial flora of these depots become interchangeable, so that a streptococcus from a throat can infect a wound and a streptococcus from a wound can infect a throat; a throat can contaminate or even infect a finger, and the finger then infects the wound. Infection may be aggravated by the addition of one species of germ to another or by the addition of one strain of streptococcus to a different strain.

The bacterial content of the air reaches its peak during sweeping and bed making, and the removal of pus-soaked dressings or plaster casts. The two great vehicles by which bacteria are conveyed are contact and air. The second of these conveys droplets and dust. Gloves must be worn for all types of surgery, including ear, nose, and throat procedures. Glove punctures may be responsible for the infection of clean wounds with the staphylococcus aureus. Baths and arm baths must have neither surface defects nor crevices and are sterilized by lysol, but even so the author is prejudiced against their use. He prefers to treat lesions of the hands by the closed method, paying great attention to rest and elevation of the part.

The only type of mask which should be used is one designed as a pocket into which is slipped a piece of cellophane or stiff paper and this mask must be at least 6 by 8 in. in size. The nose and mouth must be covered. The author favors silence in the operating theater, for bacteria are ejected and air currents are set up at the sides of the mask when one talks or coughs.

The patient must be protected from himself by means of a mask or a screen. The anesthetic apparatus should be sterilized between patients. The patient should also be masked in the ward during the dressing or at least turn his head away. A ward dressing technique should be adopted and sterilized forceps and masks play a great part in this routine. Fingers, dust, and droplets are kept away from the wounds and dressings, and even away from the skin adjoining the wound. The intelligent co-operation of the nursing staff is important.

Bedmaking, removal of plaster casts, draughts, the opening and closing of doors, traffic, the shifting of rubber floor mats, the use of hair driers for burns —all of these increase air-borne contamination. Floors should never be swept by the dry method but should be oiled or moistened. After the ward has been cleaned, it should be well ventilated for at least thirty minutes before dressings are removed from wounds. Air conditioning and filtration are provided in modern operating theaters. Other suggested and used methods have been the use of ultraviolet light to sterilize the air and the use of sterile operating rooms.

Plaster casts applied over wounds are a rich source of pathogenic bacteria. When the discharge soaks through them and dries on the outside, the cast will contaminate the bedclothes, the hands, and anything that it touches. Closed plasters on wounds should be opened in a special plaster room and not in the ward. Plaster shears must be boiled immediately after use on each plaster. Persons opening plasters should wear masks and gloves. Plasters must be moistened while being opened. Plasters which are becoming dirty and soft may be wrapped in some sterile absorbent material, which must be changed frequently to prevent pollution of the bedding. The discarded plaster must be placed at once in a closed bin. If the plaster has to be carried out of the room to the bin, it should first be wrapped in a damp sheet, which must be disinfected for use. The board or plate on which fresh plaster bandages are spread must not be contaminated with soiled plasters or plaster shears.

Blankets are a potent cause of air contamination. The author believes that they should be covered with a sheet and the ward blankets should not be allowed to enter the operating room theater.

Infections occurring in clean cases should be carefully reviewed and must in general be looked upon as a reproach to the surgeon and his team. In cutting down on veins one should use aseptic technique, as frequently this type of infected wound is one that causes trouble after the surgery is done.

LEROY J. KLEINSASSER, M.D.

White, C.: The Prevention of Hospital Infection of Wounds. *Med. J. Australia*, 1944, 1: 126.

The demonstration of hospital infection has been carried out in two ways. It has been shown that fresh wounds are frequently sterile, whereas infection is often widespread when the same wounds are subsequently examined in the hospital. It may be held that the organisms have merely increased in numbers and have become more obvious. Against this, however, is the fact that it is sometimes three weeks before the hemolytic streptococcus is recovered from a wound, and this organism does not usually lie in a wound without developing. A second line of evidence comes from the tracing of indicator organisms in their passage through a ward. Hemolytic streptococci are followed in these investigations because, although the staphylococci are commoner, the streptococci can be divided into some thirty types, and so an individual type is easily traced. In one typical case a patient with type XII group A streptococci entered the hospital. Within a short time, the wounds of 14 patients were found to have

acquired type XII group A streptococci. In 6 of these cases skin grafts failed and in some of the others cellulitis and delayed healing occurred.

The channels of infection are chiefly three: droplet infection from the nasopharynx of the surgeon or the dresser, or even the patient; carriage of organisms by the dust of the air; and contact of the wound with infected hands or utensils. These channels are linked with one another. The primary sources of infection are added to by the contamination of the bed clothing, baths, dressings, plaster casts, and instruments. The chief organisms concerned are hemolytic streptococci and pathogenic staphylococci; less frequently the infection is due to colon bacilli, the proteus vulgaris, or pseudomonas pyocyanea.

The prevention of infection is important. More attention should be given to masks and gloves. The number of gloves punctured during operation is surprisingly high, and this danger must be guarded against. The one procedure that should be given special attention in the wards is the dressing of wounds. The author believes that at least two nurses are necessary, a clean one and a nonsterile one.

LEROY J. KLEINSASSER, M.D.

Krimsky, J.: Medicine under the Czars and under Stalin. *Virginia M. Month.*, 1944, 21: 84.

Krimsky makes a comparative study of medicine under Czarist Russia and the present Soviet regime, and presents figures that are claimed to be authentic. Whereas there were 20,000 doctors in all of Russia under the Czar, there are 150,000 doctors and 300,000 trained medical assistants, midwives, and nurses under Stalin. The 150,000 hospital beds in 1913 have multiplied to 800,000, and the 7,000 maternity beds now number 140,000. These advantages are reflected in the low infant mortality of 19 per 1,000.

There are 60 medical schools as compared to 13 during the time of the Czars. It is claimed that the quality of these schools is comparable to that of the grade A medical school found in Britain and America. The tuition is free and the student's living needs are provided. After graduation he is sent to a rural community for three years, after which he is free to select his location for practice. There is, however, no private practice in Russia. Every physician is an employee of the State.

The average doctor's salary is equivalent to from $1,500 to $3,500 annually. He gets four weeks of vacation each year, with pay, three months of postgraduate work at government expense every three years, and is eligible for sick benefits and old age pensions out of the Social Security Fund. He may train himself to specialize, if he chooses, or he may devote himself to research in conjunction with or independent of his regular work. His job is not only to heal the sick, but to keep the well people well.

The All-Union Commissariat of Health is head of the vast and complex medical organization which includes the 11 federated Republics, each represented by its own Commissariat of Health.

All health and medical care is free, whatever the service: hospital, clinic, maternity, or convalescent. The Government pays all the costs out of State funds, and part of the cost is contributed by the Social Insurance Fund in which every farmer, professional worker, and government employee is insured. The total annual budget for this gigantic medical scheme is about 15 billion rubles.

To the query as to whether Russian physicians are happy under the Soviet System of State Medicine, the author answers affirmatively, but he explains the circumstance by the fact that the Russian medical worker has never experienced any set-up other than a munificent paternal government.

As a result of this prodigality, it is claimed that malaria, typhus, cholera, smallpox, typhoid, dysentery, and other plagues have decreased to insignificance. Trachoma and blindness, which were rampant, as likewise tuberculosis and syphilis, are practically nonexistent. Russia has ceased to be a health menace to the Western World.

STEPHEN A. ZIEMAN, M.D.